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IMPERIAL BUREAU OF ENTOMOLOGY.

REVIEW

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SERIES B.

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KIRK (H. B.). **On Mosquito Larvicides.**—*Trans. & Proc. New Zealand Inst. for 1917, Wellington*, l, 15th July 1918, pp. 193–196.

The control of mosquito larvae is usually effected either by means of a film that prevents their breathing when they come to the surface, or by the use of a lethal agent that diffuses evenly throughout the water. The substances generally used are crude petroleum for the former and an emulsion of crude carbolic acid for the latter.

Light oil, which comprises those constituents of coal-tar distillate that have a boiling-point up to 392° or 410° F., is very fatal to fly larvae or to adult flies when sprayed in mixture or in emulsion with 3 or 4 parts of water. It has to be applied in greater strength to kill the pupae.

Experiments with the larvae of various species of *Culex* found in New Zealand, and with the larvae of a Culicine mosquito often found in brackish water on the coast near Wellington, have shown that light oil is most useful as a mosquito larvicide, whether used as a film or as an emulsion. It makes a film that spreads more rapidly than crude petroleum; its colour enables the operator to see at a glance whether the film is complete; it is very fatal to insects, and a larva thrusting the breathing-siphon into the film is paralysed and seldom comes again to the surface. Experiments with dishes of the same size, containing equal quantities of water and the same number of larvae at the same stage, and treated with light oil and crude petroleum respectively, have shown that the larvae in the former case have all been dead, or helpless on the bottom within fifteen minutes, while those under the crude petroleum have been alive and active after an hour or more. In view of the possible breaking of the film by wind, comparative rapidity of action is a matter of great importance.

The film is best produced by spraying, but the oil may be sprinkled from a bottle or other vessel, or a leafy twig may be dipped in it and shaken over the water. A spraying instrument should be chosen without rubber tubing, as some constituents of light oil are solvents of rubber.

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Toughening of the film may be effected by well shaking up the light oil with raw linseed oil just before application, though whether the advantage gained is sufficient to justify a strong advocacy of its use is uncertain.

In testing the efficacy of crude carbolic acid, an emulsion was made as follows :—Crude carbolic acid containing about 15 per cent. phenol was heated to 212° F., finely pulverised resin was added, and the mixture boiled till all the resin was dissolved. Caustic soda was then added and the mixture kept at 212° F. for about 10 minutes, or until a perfectly dark emulsion without sediment was obtained, the mixture being thoroughly stirred from the time the resin was added to the end. It is claimed that 1 part of this mixture in 5,000 parts of water containing mosquito larvae will kill them all within 5 minutes, or in 30 minutes when used in the proportion of 1 to 8,000. The author did not obtain results as good as these, though much better ones were arrived at when using an emulsion of light oil.

Experiments with iron and copper sulphates, potassium ferrocyanide, and other well-known substances gave negligible results.

When there is no access of fresh water, an emulsion that contains nearly all the light oil that the emulsionising agent can carry and that has no needless water may be used in the proportion of 1 in 32,000. The following are reliable formulae :—(1) Soft soap, 100 parts ; light oil 440 parts ; water, 100 parts ; caustic soda, 80 parts ; the light oil being added after the other substances have been heated together to 212° F. ; the resultant substance is a thick jelly that may be liquefied by dilution with water. (2) Soft soap, 20 parts ; light oil, 50 parts ; giving a thick, jelly-like soap. (3) Castor-oil 50 parts ; caustic soda (sat. sol. of 98 per cent. caustic soda), 15 parts ; water, 20 parts ; light oil, 170 parts ; the castor oil and caustic soda being first boiled together to make an even yellow-green soap, to which the light oil may then be added ; the resulting emulsion is a clear liquid that keeps well.

Owing to the shortage of potash, soft-soap is becoming costly, and other emulsionising agents are being experimented with, good results having been obtained with resin, neatsfoot-oil, and whale-oil. The last is the cheapest and is used for work in military camps, but it is sometimes difficult to saponify it by the means available.

Ticks affecting Big Game.—*11th Ann. Rept. Dept. Agric. Province of Saskatchewan for Sixteen Months ended 30th April 1916, Regina,* 1916, pp. 232–235, 2 figs. [Received 3rd October 1918.]

Dermacentor albipictus (moose-tick or wood-tick) is not generally considered to be of economic importance, but of recent years it has been recorded as an important pest of horses and cattle, especially the former. Reports from California, Montana and Oregon state that in districts infested by *D. venustus* (Rocky Mountain spotted-fever tick) the combined attack of these two species, together with a shortage of feed in spring, often causes the death of numbers of horses in cases where they are not properly cared for.

D. albipictus has also been recorded from Manitoba on the moose, and is found also on the wapiti and horse, being a common species

throughout the northern United States and Canada. It does not drop off its host to moult, and is found upon it chiefly during the winter and spring months. The scarcity of moose in some seasons is attributed to the attacks of ticks in the previous spring, the pests being present in thousands and causing the death of the host from exhaustion following loss of blood.

The non-parasitic part of the life-history begins in the spring, when the engorged fertilised female drops off the host to oviposit. Under laboratory conditions in British Columbia, oviposition began in April, 3,000 to 5,000 eggs being deposited by each female during the months of May and June, and the larvae began to emerge in July. It was found that the pre-oviposition period ranged from 7 to 134 days, the incubation period from 33 to 71 days, and the longevity of the larvae from 50 to at least 346 days. The combined periods range normally from 159 to 479 days. The larvae attach themselves to their host during the autumn, winter and spring months.

DUNN (L. H.). **The Lake Mosquito, *Mansonia titillans*, Wlk., and its Host Plant, *Pistia stratiotes*, L., in the Canal Zone, Panama (Dip.: Culicidae).**—*Entom. News, Philadelphia*, xxix, nos. 7–8, July-October 1918, pp. 260–269 & 288–295.

Prominent changes in the flora and insect fauna of the Canal Zone, Panama, have been caused by the formation of the great artificial lake covering more than 170 square miles and having a maximum depth of more than 87 feet. Part of this area was known as the "black swamp," and in this region, several square miles in extent, a few scattered masses of *Pistia stratiotes* (wild water lettuce), the host plant of *Taeniorhynchus* (*Mansonia*) *titillans* (lake mosquito), occurred in various small bodies of water. The spread of the plant at this time was very slow, and the mosquitos were present in relatively small numbers. However, with the rising of the lake the plants were carried to the periphery of the inundated lowlands, where the thick forest growth and stagnant waters offered good protection. Consequently they increased so rapidly that large floating islands were soon formed, covering the surface of the water in masses several miles in diameter.

The association of the larvae of *T. titillans* with the *Pistia* plant was first discovered in 1910. The eggs are attached in a mass to the under-surface of a *Pistia* leaf lying flat, or nearly so, on the surface of the water. When the larva emerges from the egg it descends into the mass of rootlets and pierces the thin outer skin of one of them with its pointed air siphon, which remains in the opening, the larva completing its development attached in this manner to the host-plant. It feeds on the microscopic plankton, desquamations from the plant roots, and other vegetable débris found in abundance among the root-masses, the particles often becoming attached to the larva in such a way that it resembles a piece of decayed vegetable fibre.

Under laboratory conditions the larvae develop very slowly and are difficult to rear, seeming to thrive better in water that is stagnant and quite foul with vegetable débris than in clean fresh water. When placed in a dish containing no plant life the larvae are able to live for

a few days as free living larvae, somewhat similar to those of *Culex*. However, they seldom live longer than 5 or 6 days in a jar that does not contain *Pistia* plants.

The pupa forms and escapes from the larval skin without causing the latter to become detached from the air-supplying rootlet, the pupal period ranging from 2 to 5 days, 3 being the average. The emergence of the adult occurs at night, possibly during the early morning hours, the pupa becoming detached from the plant and rising to the surface of the water, where the pupal skins are always found.

T. titillans is tropical or sub-tropical in its habitat, being found in some parts of the southern United States, Mexico, Central and South America, and the Antilles. In Panama it is at present the most ubiquitous mosquito of the Gatun Lake region. Being a strong flier, it travels long distances and may be met with in the jungle several miles from the lake shore. It bites readily at all hours between sunset and sunrise, but shuns the light as much as possible and does not usually bite in broad daylight. This species is a persistent biter, readily piercing even the tough cuticle of the palm of the hand, and thin clothing offers but little protection against its attacks. The feeding of a female sometimes continues for a period exceeding 10 minutes, and one specimen, kept alive in captivity for 17 days, in that time took 14 blood meals. *T. titillans* is present in the Canal Zone throughout all months of the year, but is most abundant from late April to early October.

As far as known at present this mosquito is not concerned with the transmission of any disease to man or domestic animals, but should it ever prove to be a vector, the only means of eliminating it will be by the eradication of *Pistia stratiotes*, which is presumably essential to its larval existence. These plants are readily killed by arsenical sprays and will decay and sink in from 6 to 8 days after treatment. They are remarkably free from natural insect enemies, there being only one, the larva of a small moth, *Samea multiplicalis*, Gn., which destroys large numbers by tunnelling into, and feeding upon, the leaves. This, however, does not constitute an efficient control, owing to the rapid propagation of the plant by means of both seeds and runners.

SNYDER (T. E.). **A Peculiar Habit of a Horsefly (*Tabanus americanus*) in the Florida Everglades.**—*Proc. Entom. Soc. Washington, D.C.*, xix, no. 1–4; March, June, September, December, 1917: pp. 141–145, 2 plates. [Received 22nd October 1918.]

During the month of March 1917, many thousands of adults of *Tabanus americanus* were observed in flight over one district in Dade County, Florida. The flies took to the wing at daybreak; each morning they could be heard leaving the tree-trunks where they had been resting and striking the foliage as they rose. The flight generally lasted about twenty minutes, beginning with a buzzing sound that gradually increased to a dull roar. Individuals hovered particularly over openings in the forest or over the road, in the manner of Syrphids. It is not known whether this is a mating flight. Mules in the district were protected with closely-fitting coverings of sacking; men were

attacked even through thick clothes. By the end of June individuals of *T. americanus* had almost disappeared, while another species of Tabanid had become more numerous.

MASTERMAN (E. W. G.). **Jerusalem from the Point of View of Health and Disease.**—*Lancet, London*, cxciv, no. 4930, 23rd February 1918, pp. 305–307, 2 figs.

Malaria is the greatest scourge of Jerusalem, being practically universal in autumn when the malignant tertian form is prevalent. Mosquitos are abundant, and of these *Anopheles maculipennis* is plentiful.

BABER (Lieut. E.). **A Method of Trapping Fly Larvae in Manure Heaps.**—*Lancet, London*, cxcix, no. 4935, 30th March 1918, p. 471, 1 fig.

This method is used at Potchefstroom Camp, Transvaal, in dealing with the manure of over 1,000 horses. It consists in isolating the manure heaps by sinking round them a gutter 3½ inches deep, which is not V-shaped, but has concave sides with the greatest depth of the curves near the lips (ground-level), so that there is a marked overhang. The sides must be smooth, and at Potchefstroom sheet metal for the purpose was obtained from paraffin tins. Fly larvae are unable to climb such surfaces and they can only live in the space between the edge of the heap and the gutter, being quickly killed by the heat inside the heap (130° –160°F.). The general plan of the trap is a narrow rectangle, the gutter for one of the short sides being moveable. This short gutter is simply laid on the ground and the earth from the manure heap to it is banked up so that the larvae can get into it without difficulty. Its ends are open so that the larvae can drop into the long sunk gutters on either side. This loose gutter is moved along as the heap increases, while the manure at the other end may be removed after sufficient time has elapsed to ensure the destruction of the larvae there. Close attention to minutiae is essential if this method is to be successful. The adult flies that are attracted to the heap are destroyed by the sodium arsenite bait method, leafy branches sprayed with this poison being hung from a wire stretched over the top of the dump.

HOUGH (F. P. W.). **Extermination of Mosquitoes at the Naval Proving Ground.**—*U. S. Naval Bull., Washington, D.C.*, xii, no. 1, January 1918, pp. 144–146.

Owing to their location, the naval proving ground and smokeless powder factory have always had a bad reputation for mosquitos, and malaria has been prevalent. Anophelines represented about 10 per cent. of the mosquitos present. Oil had been used regularly and all Navy quarters and offices were well screened. The former measure was not practical owing to the ground being swamp land. A campaign was begun in the early spring [of 1917], the insecticide used being "nitre cake," a by-product in the manufacture of powder, so that the total cost of the work was the pay of one labourer and the supervision of the medical officer. Nitre cake is an impure sodium

acid sulphate, containing about 30 per cent. free acid. This substance being solid and partly granular, dissolves slowly, and it has been found that in water containing 10 per cent. by volume of the sulphate the mosquito eggs will hatch, but the larvae nearly all die, very few reaching the pupal stage. In practice a much stronger solution was obtained by well loading the pools. Grass and weeds around the pools are killed by the acid, which is an advantage on land of this character. Mosquitos appear to have been almost eliminated and the cases of malaria have decreased, no new ones having been treated during the year.

BONNE (C.). **A Dengue-like Fever in Dutch Guiana.**—*Jl. Trop. Med. Hygiene, London*, xxi, no. 18, 16th September 1918, pp. 189–193, 8 charts.

In 1917 several cases of a benign fever of the dengue type were observed at Paramaribo, Dutch Guiana, a colony from which no dengue or fever allied to dengue has ever been described. All the well developed cases were in newly-arrived individuals or in children, and none occurred among the Creole, negro and mulatto populations, which enjoy an acquired immunity. Among the abundant mosquitos present were *Culex fatigans* (*quinquefasciatus*) and *Stegomyia fasciata* (*Aëdes calopus*).

CHALMERS (A. J.). **Notes on some minor Cutaneous Affections seen in the Anglo-Egyptian Sudan.**—*Jl. Trop. Med. Hygiene, London*, xxi, no. 19, 1st October 1918, pp. 197–200, 7 figs.

At Khartoum cases of oedema of the eyelids are ascribed to the bites of ants, and it is stated in this paper that where ants were kept away from beds by means of powdered camphor no swellings of the eyelids occurred.

GABBI (U.). **Febbre di Tre Giorni.** [Three Day Fever.]—*Malaria e Malattie dei Paesi Caldi, Parma*, ix, no. 3–4, May–September 1918, pp. 78–83, 2 figs.

This is a monograph intended for medical men and students. *Phlebotomus papatasii* is the subject of a brief mention as the carrier.

FERMI (C.). **Sull' effettuato Risanamento antimalarico di Trinitapoli.** [The Successful Liberation of Trinitapoli from Malaria.]—*La Malariologia, Naples*, Ser. I, xi, no. 1, 28th February 1918, pp. 3–23.

This is a detailed description of the measures successfully adopted at Trinitapoli, province of Foggia, against malaria. The work was done on lines similar to those employed in Sardinia [see this *Review*, Ser. B, v, p. 117].

MCCULLOCH (Col. C. C.). **Dengue Fever.**—*New Orleans Med. & Surg. Jl., New Orleans*, lxx, no. 9, March 1918, pp. 694–706.

The major portion of this paper is clinical. The history of dengue is dealt with. The causal agent is an intramuscular organism in the

blood, somewhat similar to the *Piroplasma* (*Babesia*) *bigeminum* of Texas cattle fever. *Culex fatigans* is the principal transmitter, but Brooks recorded *Stegomyia fasciata* (*calopus*) as the only mosquito present in one epidemic observed by him, and in Australia in 1916 this mosquito was experimentally proved to be a vector [see this *Review*, Ser. B, iv, p. 196].

Dunley-Owen (Major A.). **Notes on Malaria.**—*S. African Med. Record, Cape Town*, xvi, no. 9, 11th May 1918, pp. 136–138.

This paper is a record of the author's experience in the treatment of malaria. With regard to the question whether the mosquitos of the Cape are malaria carriers, a case is instanced where this was undoubtedly true: a soldier who had never had malaria and who had lived in the Cape Peninsula for the past six years having a heavy infection of subtertian rings, while crescents were found a few days later.

Le Prince (J. A.). **Malaria Control in the Environment of the Cantonments.**—*Southern Med. Jl., Birmingham, Ala.*, xi, no. 8, August 1918, pp. 551–554.

This paper describes the anti-mosquito measures employed for the military cantonments and aviation fields established in the southern States of the Union during the present War. The work has been done on recognised lines, varying according to local geographical conditions.

Derivaux (R. C.). **Some Results of Malaria Control by Control of the Insect Host: Public Health and Economic Aspects.**—*Southern Med. Jl., Birmingham, Ala.*, xi, no. 8, August 1918, pp. 556–561, 4 charts.

This is a synopsis of results gained in a number of control campaigns conducted under the advisory supervision of the United States Health Service, anti-mosquito work being in most cases the chief, and in some the sole measure adopted. Abstracts of the reports have already been published.

Jarvis (E. M.). **Report on Ixodic Lymphangitis (German East Africa Campaign, 1916–1917) made to the A.D.V.S., Dar-es-Salaam.**—*Vet. Jl., London*, lxxiv, no. 2, February 1918, pp. 44–53.

This paper describes a number of conditions due to secondary infection of wounds caused by the bites of ticks in horses, mules, asses, and more rarely cattle and sheep. The micro-organisms concerned include the Preis Nocard bacillus, *Cryptococcus farciminosus* (occasionally), the necrosis bacillus, staphylococci, etc. In Southern Rhodesia the disease was almost entirely spread and mechanically conveyed by a tick, *Amblyomma variegatum*, but it seems to have disappeared from there since tick eradication was effected. It is stated that an examination of over 1,000 cases in "German" East Africa showed that 75 per cent. contracted the disease through the

agency of *Amblyomma* and 20 per cent. through the agency of *Stomoxys*. The remaining 5 per cent. were directly inoculated through the entry of organisms by abrasions from thorns, etc. That the one genus of ticks should be so pernicious is due to the length of the rostrum, to the habit of keeping the rostrum pendulous and so scooping up the virus off contaminated ground, to the polyandrous habit aggravating the lesion, and to the considerable longevity of the tick, affording it an opportunity of leaving an infected host and attaching itself to another. *Stomoxys* and Tabanids have been observed to infect unabraded tissue by direct inoculation, and tick birds may be mechanical carriers, as they peck at open wounds and go from one animal to another. As regards prophylaxis, the author found in Southern Rhodesia that if ticks were pulled off within 12 hours no infection resulted, as the rostrum had not penetrated to the subconnective tissue. In the East African campaign this measure proved fairly successful in the 4th S.A. Horse on the march. Even up to 24 hours the disease could be prevented by pulling the ticks off (rostrum and all), squeezing the minute sinus which exudes a serous discharge, and painting with iodised phenol (1 : 4). This method was eminently successful [in South Africa] and all the B.S.A. police were supplied with a small bottle and brush, and not one case occurred in the force after its practical application. It could not be employed during this campaign as drugs were unobtainable. Under peace conditions tick eradication, the destruction of flies and of refuse, and the segregation of malignantly infected wounds, may be adopted, but this policy would require a few years.

BALLOWE (H. L.). **The Breeding of Mosquitos in Alkaline Water.**—*Psyche, Boston, Mass.*, xxv, no. 4, August 1918, p. 96. [Received 31st October 1918.]

The case is recorded of both *Anopheles* and *Culex* breeding in large numbers in a solution of caustic soda, prepared to kill San José scale and left standing exposed to the weather for about eight months. Adults that developed from this solution appeared normal.

MARTINI (E.). **Körperentlausung durch Enthaarungspulver zwecks Fleckfieberbekämpfung.** [Freeing the Body from Lice by means of a Depilatory in order to combat Typhus.]—*Münchener Med. Wochenschr., Munich*, lxv, no. 15, 9th April 1918, p. 404.

In maintaining the body free from lice, especially in the case of individuals not over-particular as to the condition of their persons, the use of a depilatory powder was found very valuable in Poland. The powder contains strontium sulfuricum 2 parts, zinc oxide 1 part, and powdered talc 1 part. For use the powder is worked to a thin paste with water and this compound is then spread on the hair that is to be removed. In 10–15 minutes the application is dry and may be lifted off the skin which remains quite smooth. This method is not recommended for use on the head and face. It must be followed by a bath and the skin which has been treated may require to be slightly greased with oil or vaseline.

Kirschbaum (—). **Zur Epidemiologie der Malaria.**—*Münchener Med. Wochenschr., Munich*, lxv, no. 39, 24th September 1918, pp. 1074–1076.

The author confirms the conclusions reached in a previous paper with the same title [see this *Review*, Ser. B, vi, p. 58] that the malaria outbreak was due to latent infection, the plasmodia in man being rendered active by the warmth of spring. The climate in summer in this region of north-western Russia seems so unfavourable to the development of plasmodia in the mosquito that big epidemics are not to be feared. In 1917 the number of cases was only 37·6 per cent. of that in 1916; only 6 occurred among civilians, none being in children. This would prove that the infection was introduced by German troops from other parts of Russia.

Report of the Government Entomologist on the Spread of the Tsetse Fly and Trypanosomiasis in the Wankie District.—*British S. Africa Dept. Agric., Salisbury*, 23rd June 1918. [MS. Received from the Colonial Office 10th October 1918.]

The results of investigations into tsetse-fly conditions in various localities of the Wankie District of Southern Rhodesia are reported and discussed. The problem of dealing with the increase in abundance of the fly [*Glossina morsitans*] and the consequent spread of trypanosomiasis has become a serious one. The suggestions made as to the measures calculated to check the fly include:—(1) Throwing open a guard area to free shooting. This it is believed would probably do more harm than good, as it would almost undoubtedly lead to poaching in neighbouring fly country with the result of driving game back into the open area; while a remote area would never be thoroughly cleared by professional hunters for the reason that it would not pay. (2) Organised destruction of game, by driving big game from a guard area and keeping that area free. By this means a state of equipoise might be reached between the tendency of the fly to spread and human efforts to keep it back. This would entail the permanent employment of one or more wardens with a staff of native hunters, and is considered to be out of the question. It is thought, however, that a properly organised attack on the whole area invaded or threatened by tsetse-fly would have an excellent chance of success. This idea involves the wholesale extermination of game, first around the boundaries of the infected area and gradually towards the centre, and such an undertaking appears both feasible and economically sound. (3) Deforestation of a guard area. A difficulty about this scheme is that it is not known how wide a cleared area would prove an effective check; it is thought that the cleared strip should be at least 200 miles long and would consequently cost a large sum of money to establish and maintain, while it would very likely prove ineffective. (4) Deforestation of a strip of country, perhaps a mile wide, fenced on both sides to prevent game crossing over. While this might be an effective barrier it would be far too expensive in construction and maintenance and too doubtful in result to be worth serious consideration. (5) Destruction of winter haunts in threatened areas. It is suggested that as the fly is dependent

during the time that the trees are leafless upon evergreen trees in the vicinity of water courses, the removal of such trees would probably render the locality unsuitable as a permanent fly belt.

In conclusion it is pointed out that no method of definitely checking tsetse is known, and any measures taken must be in the nature of experiments. The necessity for beginning dipping experiments in relation to tsetse-fly as quickly as possible is emphasised.

DUNN (L. H.). **The Tick as a possible Agent in the Collocation of the Eggs of *Dermatobia hominis*.**—*Jl. of Parasitology, Urbana, Ill.*, iv, no. 4, June 1918, pp. 154–158. [Received 16th October 1918.]

The case is recorded of man being attacked on several occasions by ticks in the interior of Panama, the wound caused by the bite of the tick being discovered later to be infested with a larva of *Dermatobia hominis*, which had evidently hatched from an egg deposited by the tick during its attack. The tick concerned was in all probability *Amblyomma cajennense*, which has a variety of hosts and attacks man and all classes of both domestic and wild animals with equal freedom. The incrimination of ticks in the dispersion of eggs of *D. hominis* opens up a new field. Previous writers have adduced more or less convincing evidence that a mosquito, *Janthinosoma* (*Psorophora*) *lutzi*, is the active agent in this dispersal, but it has never been proved to be the sole carrier. Among many mosquitos collected at the time and in the vicinity of the above-mentioned attacks, *J. lutzi* was not found.

CORY (E. N.). **The Control of House Flies by the Maggot Trap.**—*Maryland State Coll. Agric. Expt. Sta., College Park*, Bull. no. 213, February 1918, pp. 103–126, 12 figs. [Received 15th October 1918.]

The subject-matter of the first part of this bulletin has already been noticed [see this *Review*, Ser. B, iii, p. 134].

In the years 1914, 1915 and 1916 the average percentage of maggot destruction was 95·8 per cent. The reduction in fly prevalence in 1914 was 76 per cent., but in 1915 and 1916 this was not so marked, the apparent discrepancy being probably due to the presence of additional fly breeding sources and the difficulty of obtaining accurate results on fly reduction. Modifications of the traps as dictated by experience have evolved a trap that is practical for the farm producing large quantities of manure daily.

The close packing of manure, the watering of the heap and the return of leached materials to the manure tends to conserve its fertilising value, and the labour involved is only slightly greater than that required to dump the manure in a heap. The saving in fertiliser and the destruction of a large percentage of the flies, particularly on isolated farms, will more than repay the cost of construction and operation.

A table shows the seasonal prevalence, from July to October, of the flies trapped, including:—*Musca domestica, Muscina stabulans, M. assimilis, Pollenia rudis, Phormia regina, Lucilia caesar, L. sericata, Calliphora vomitoria, Graphomyia maculata, Ophyra leucostoma,*

Stomoxys calcitrans, *Pseudopyrellia cornicina*, *Morellia micans* and *Chrysomyia macellaria*, the latter not having been previously recorded from Maryland.

Barker (C. N.). **Some Records of Predaceous Insects and their Prey in the Durban Museum.**—*Ann. Durban Museum*, ii, no. 2, 30th July 1918, pp. 94–96.

A species of *Bembex* is recorded as preying upon seven species of Asilids, two of Tabanids, *Glossina morsitans*, Westw., and *Sarcophaga haemorrhoidalis*, Mg.

Barbará (B.) & Dios (R. L.). **Contribución al Estudio de la Sistemática y Biología de los Ixodidae de la República Argentina y de algunos Países vecinos.** [Contribution to the Study of the Systematic Position and Biology of the Ixodids of the Argentine Republic and some neighbouring Countries.]—*Rev. Inst. Bacteriológico Dept. Nac. Higiene, Buenos Aires*, i, no. 3, April 1918, pp. 285–322, 3 plates. [Received 18th October 1918.]

This study of the parasitic Arthropods of domestic and wild animals of the Argentine Republic and neighbouring countries has been undertaken in view of the increased interest in the subject from the point of view of the transmission of disease. A key is given to the species of ticks known to occur in the countries investigated, including : Argasidae, *Argas persicus*, Ok., a common parasite of domestic poultry, to which it transmits spirochaetosis, living in the crevices of hen-coops and pigeon-houses and attacking the birds at night *Ornithodorus megnini*, Dug., is frequently found in the ears of sheep, cattle and llamas and sometimes of man, particularly children. *O. talaje*, Guér., recorded from Asunción, Paraguay, is found in cracks in the walls of houses and hen-coops ; this species remains hidden during the day and attacks both man and animals in the night. *O. turicata*, Dug., is parasitic upon man and pigs and is probably identical with *O. rostratus*, Arag., which is believed to be the transmitter of relapsing fever in Colombia.

Representatives of the Ixodidae include *Amblyomma altiplanum*, Dios, abundant on llamas and apparently peculiar to this host ; *A. agamum*, Arag., found on a snake, *Xenodon merremi*, investigations on this species indicating that it is parthenogenetic, though this has not been definitely proved ; *A. brasiliensis*, Arag., from Paraguay ; *A. cajennensis*, F., which is widely distributed in sub-tropical America, attacking man as well as practically all domestic and wild animals ; *A. maculatum*, Koch, which is common in Argentina, the habitual host being the dog, though cattle, deer and sometimes horses are also attacked ; *A. testudinis*, Con., taken on tortoises ; and *Boophilus* (*Margaropus*) *annulatus* var. *microplus*, Can.

Shipyard Sanitation. — *California State Bd. Health Mthly. Bull., Sacramento*, xiv, no. 2, August 1918, pp. 61–64, 3 figs. [Received 19th October 1918.]

The entire shipbuilding industry of California has lately been threatened owing to the heavy infestation by mosquitos of the marshy

land surrounding the shipyards, and the consequent interruption of work. The matter became so serious that the Consulting Entomologist of the State Board of Health was detailed to deal with it. Drainage operations on the marsh were undertaken, with oiling of the pools where ditching and draining was impossible. The complete abatement of the mosquito nuisance was secured in the vicinity of the shipyards by these measures. The restaurants that have sprung up in the vicinity to meet the requirements of largely increased bands of shipbuilders have also been inspected; these were found to be in a very insanitary condition and have been greatly improved, all places where food is exposed being now screened from flies.

ROBERTSON (W. A. N.). **Diseases of Sheep.**—*Jl. Dept. Agric. Victoria, Melbourne*, xvi, no. 7, July 1918, pp. 410–415. [Received 19th October 1918.]

Among the diseases of sheep dealt with in this paper is that caused by the sheep bot-fly [*Oestrus ovis*] [see this *Review*, Ser. B, vi, p. 93]. The infestation very seldom does any serious harm to the animals. To prevent the adult flies from attacking sheep it is suggested that battens smeared with tar should be placed about two inches apart over a trough of food or over the lick. The tar becomes smeared on the nostrils of the sheep and acts as a repellent to the fly.

TAYLOR (F. H.). **Australian Tabanidae [Diptera]. No. iii.**—*Proc. Linn. Soc. N.S.W., Sydney*, xlii, no. 3, 31st October 1917, pp. 513–528, 1 plate. [Received 21st October 1918.]

This paper includes notes on the following Tabanids: *Pelecorhynchus maculipennis*, Macq., *P. fusconiger*, Wlk., *P. mirabilis*, sp.n., *Erephopsis gibbula*, Wlk., *Diatomineura auriflua*, Don., *D. testacea*, Macq., *D. pulchra*, Ric., *D. montana*, Ric., *D. auripleura*, sp. n., *Corizoneura fulva*, Macq., *Palimmecomyia celaenospila*, gen. et sp. n., *Silvius stradbrokei*, sp. n., *S. psarophanes*, sp. n., *Demoplatus australis*, Ric., *Caenoprosopon hamlyni*, sp. n., *Tabanus hackeri*, sp. n., *T. confusus*, sp. n., *T. parvicallosus*, Ric., *T. laticallosus*, Ric., *T. rufoabdominalis*, sp. n., *T. dubiosus*, Ric., *T. froggatti*, Ric., *T. edentulus*, Macq., and *T. brisbanensis*, sp. n.

The Cattle Tick in Australia.—*Commonwealth of Australia Advisory Council of Science & Industry, Melbourne*, Bull. no. 1, 1917, 30 pp., 4 plates. [Received 22nd October 1918.]

Boophilus australis (cattle tick) may affect the health of cattle in two distinct ways, namely by conveying tick fever and by the irritation, etc., caused by its presence. This fact of the tick being capable of giving rise to sickness *per se* by gross infestation, has not always been recognised, and early records of the pest refer almost exclusively to tick fever. The particular form of piroplasmosis known as tick fever in Australia is due to *Piroplasma* (*Babesia*) *bigeminum*, which is also the cause of Texas fever in the United States of America and similar diseases in Europe, Asia, South America and South Africa.

It is considered probable that this pest was introduced into America by cattle imported by the Spaniards during the early colonisation of Mexico. Circumstantial evidence points to the importation of Brahma cattle from Batavia into Australia in 1872 as being the source of Australian infestation.

This bulletin deals at length with the life-history of the tick, tick infestation, tick fever, its treatment, and measures of protection against it. Of these, artificial inoculation confers immunity for a period of 1 to 2 years, or occasionally longer in individual cases. An inoculated individual, however, acts as a reservoir of infection, and since all ticks are not infective, there is little doubt that protective inoculation has been an important factor in the dissemination of tick fever in certain centres in Queensland. In New South Wales an official embargo exists against inoculation, as, with the exception of a single locality on the Queensland border, infective ticks are not known to exist in that State.

The loss from mortality caused by tick fever in Queensland alone is estimated at £7,000,000 sterling, and considerable loss from this cause has also occurred in the Northern Territory and Western Australia. Further, the affected States have suffered considerable direct loss from deaths due to tick worry, interference with the natural increase of the herds, retardation of growth and improvement of stock, and from diminished production of meat, milk and dairy products. The decrease in the value of leather production of Queensland amounts to about £114,000 for one year alone. Apart from these direct losses, the expenditure occasioned in connection with the erection and maintenance of dipping vats, and general disturbance of stock business, is also very considerable. The cost to New South Wales of putting into operation restrictive measures has amounted for the past 5 years to £123,480. Moreover the value of land in infested and adjoining areas has depreciated even up to 40 per cent., and when the extent of acreage involved is considered, this loss alone becomes stupendous.

The general methods of tick eradication directed against the pest in its free existence are the "starving-out method," usually combined in practice with the "pasture rotation" system. By this means all possible hosts of the tick are excluded from pastures until sufficient time has elapsed for the tick to die out and the eggs to perish, the cattle being removed systematically to clean pastures before the eggs laid by the matured females dropping from them have time to hatch out. The land thus vacated is immediately placed under cultivation, and is not re-stocked until it may be assumed to be tick-free. Field observations in the north coast districts of New South Wales indicate that this period exceeds one year.

The most efficacious direct method of dealing with the pest is by attacking it during its parasitic existence by hand-picking and grooming or by hand-dressing and spraying, or by dipping, the last being the only practicable way of treating unhandled cattle and horses. It is also the cheapest method for the treatment of large numbers. Experience has shown that arsenic is the only reliable tick-destroying agent, there being several efficient official formulae for arsenious cattle dips, such as:— Queensland Cattle Dip "A,"—Arsenious acid 8 lb., caustic soda 4 lb., Stockholm tar ½ gal., tallow or oil (animal or vegetable) 4 lb., water 400 gals.; Queensland Cattle Dip B,—Arsenious acid 8 lb.,

caustic soda 4 lb., bone oil 1 gal., water 400 gals.; New South Wales Dip,—Arsenious acid 8 lb., washing soda 12 lb., common hard soap 2 lb., Stockholm tar (best) ½ to 1 gal., water—add to 400 gals.

The effect of these arsenical preparations is not immediately noticeable, and for eradicating the pest the treatment must be continuous and systematically carried out, dipping being practised every fifteenth day. The tendency is for owners to stop treatment too soon, with the result that eradication is often approached but not accomplished.

The success that has attended tick-eradication work in the United States is primarily due to the educational campaign. The treatment adopted is thoroughly and systematically applied, and, as eradication is aimed at in America, the yards, dipping vats and other structures used in connection with the work are not of a permanent character, and are therefore cheaper, which means that more are acquired for a given outlay. The work has been greatly facilitated by the Federal authorities assuming control of stock and of satisfactory fencing operations, by the existence of an extensive system of railways, and, to a material degree, by the severity of the winter weather being inimical to tick life.

In New South Wales, the main operations have so far aimed at keeping the tick from spreading south, and there does not appear to be any prospect of complete eradication of the pest under the existing disabilities which are inseparable from State Administration. Even when it has been accomplished, as has been the case in two large areas, there is always the risk of re-introduction from Queensland, unless extermination is effected there also. Many of the difficulties that militate against eradication in New South Wales obtain in Queensland in an accentuated form, and there seems but little likelihood of the tick being exterminated until operations are sustained by Federal intervention.

Worm Nodules in Cattle.—*Commonwealth of Australia Advisory Council of Science & Industry, Melbourne*, Bull. no. 2, 1917, 31 pp. [Received 22nd October 1918.]

This bulletin contains the report of a special committee appointed to enquire into the nodule disease in cattle and to make recommendations as to a future plan of research. The deliberations of the committee came under two heads:—The economic aspect of the worm nodule question, having regard to the necessary mutilation of infested carcases before export; and the scientific aspect, two series of investigations being conducted, one in view of the hypothesis that the transmitting agent is a biting fly, and the other that the parasite is probably water or soil borne. The committee recommended that specific experiments should be undertaken to ascertain whether biting flies are the transmitters of this parasite, and that the full financial assistance asked for be granted. In the opinion of some members of the committee the discovery of the source of infection may eventually save Queensland over £1,000,000 per annum, if the grazier is aided in preventing infection.

Other papers included in this report deal with the occurrence of onchocerciasis in cattle and associated animals in countries other than Australia [see this *Review*, Ser. B, iv, p. 70]; bovine onchocerciasis

in South America [see this *Review*, Ser. B, v, p. 88]; and investigations into the cause of onchocerciasis in cattle conducted in the Northern Territory [see this *Review*, Ser. B, iv, p. 8, and vi, p. 27].

CLELAND (J. B.), DODD (S.) & MCEACHRAN (J. F.). **Further Investigations into the Etiology of Worm-nests in Cattle due to** *Onchocerca gibsoni*.—*Commonwealth of Australia Advisory Council of Science & Industry, Melbourne*, Bull. no. 2, 1917, pp. 19–29. [Received 22nd October 1918.]

Accounts of earlier investigations on this subject by one of the present authors have already appeared [see this *Review*, Ser. B, iii, p. 207, and v, p. 110]. The experimental results of the work here detailed were, in both instances, negative, owing to the small number of both Tabanids and mosquitos present during the season.

Report of the Medical Officer for 1917-1918.—*Forty-seventh Ann. Rept. of the Local Govt. Bd., 1917–18*; *London*, 1918, pp. i–lxxviii. [Received 24th October 1918.]

Among the insect-borne diseases dealt with in this report are plague, which occurred on two vessels arriving in the Thames. Both ships came from the infected port of Bombay and carried cargoes attractive to rats, *Mus rattus* being the species commonly found on board. There was no extension of the infection after the vessels had been dealt with by the London Port Sanitary Authority. Louse-borne diseases such as typhus and trench fever largely increased owing to War conditions, and infestation by lice and scabies have become widespread among the civil population. Recently, however, methods adopted for disinfection and destruction of lice in the army have greatly increased in efficiency, and up to the present there has been no case known in which soldiers returning to this country have brought with them the infection of typhus, or of trench fever. During 1917, 178 cases of locally-acquired malaria were recorded in England. The areas affected were mostly those in which malaria or ague had been very prevalent up to the middle of the last century, and it is probable that in these and other areas a considerable risk arises of the re-establishment of endemic centres of malaria owing to the return from abroad of men who are carriers of the malaria parasite.

LÉGER (L.). **Grandes Lignes de la Répartition géographique des Zones Anophéliques dans le Sud-est de la France et Méthode d'Etude.** [The Geographical Distribution of the Anopheline Zones in South-eastern France and the Method of Studying them.]—*C.R. hebdom. Acad. Sci., Paris*, clxvii, no. 11, 9th September 1918, pp. 399–401.

The study of the geographical distribution of Anophelines in South-eastern France in the region east of the Rhône is of great interest on account of the varied climatic and physical features of this region. High mountains, elevated plateaux, hills, and wide or deeply cut valleys, afford varied habitats for each of which the presence and distribution of an Anopheline species and its relation to ancient or present-day malaria must be worked out. Although the exploration of this region is not completed, it is clear that the distribution of

Anophelines and consequently of malarial centres in so varied an area is difficult to define. It is in some way connected with the geographical features of the country and from that point of view the breeding-places, or zones of breeding-places, may be grouped as follows:— Those at the bottom of valleys, those at river mouths or deltas, those of the sea-shore, of the plains, of the plateaux, and artificial breeding-places.

Taken as a whole, the south-eastern region appears to be relatively slightly mosquito-infested compared with other parts of France, although mosquitos occur frequently in the South and some littoral districts. Apart from the valleys and littoral zones and doubtless other points in the interior not yet located, it offers, with its massive mountains and hills often extending to the sea, a vast area where malaria has small chances of becoming established.

Léger (L.) & Mouriquand (G.). **Anophèles et anciens Foyers paludiques dans les Alpes.** [Anophelines and Malarial Centres in the Alps.] — *C.R. hebdom. Acad. Sci., Paris,* clxvii, no. 13, 23rd September 1918, pp. 461–463.

The greatest altitude at which Anophelines have been met with in the Alps is 4,950 feet, at Villar-d'Arène, where nearly full-grown larvae of *A. bifurcatus* have been found in mid-August in almost stagnant water of a temperature of 68° F. Other apparently suitable sites containing *Culex* at greater altitudes (6,000 feet) have been found free from *Anopheles*. At lower levels Anopheline sites become more and more frequent, *A. bifurcatus* and *A. maculipennis* occurring in great numbers at about 3,700 feet. Below 3,600 feet *A. maculipennis* is the dominant species in summer, *A. bifurcatus* being discovered only at the end of spring. Near Grenoble (3,300 feet) both species have been found in abundance in August. At Modane (3,222 feet) several breeding places of *A. maculipennis* have been discovered, while at 3,300 feet in water comparatively cold (57° F.) only *A. bifurcatus* has been found. Below 3,000 feet the sites are more extensive, and *A. maculipennis* is the dominant species, at least in summer.

Though Anophelines are thus widely distributed, outbreaks of malaria, which appear to have been always rare and local, have actually disappeared. The disease does not appear to be capable of maintaining itself at altitudes greater than 2,100 to 2,400 feet; even then special conditions of temperature are necessary, such as those obtaining in the deeply embanked plain of Bourg d'Oisans, where the summer temperature is specially high.

These mountains therefore constitute an excellent environment in summer for malarial convalescents, both from their security, from the prophylactic point of view, and from the beneficial action of altitude on malarial anaemia. Altitude has also a beneficial effect on the number and frequency of malarial attacks.

Legendre (J.). **Note sur les *Stegomyia* de Tamatave.** [A Note on the *Stegomyia* of Tamatave.]—*C.R. Soc. Biol., Paris,* lxxxi, no. 16, 12th October 1918, pp. 832–833.

Besides *Stegomyia fasciata*, which is known to occur throughout the coast of Madagascar, the author records the presence at Tamatave,

the port of the eastern coast, of *S. albopicta* (*scutellaris*), which occurs, though less abundantly than the former, in hollows in trees, or in water in wooden receptacles, either natural or artificial. The only species of *Culex* which occurs in *C. argenteo-punctatus*, which is not numerous, the permeability of the sandy soil rendering stagnant pools impossible. Anophelines have also almost completely disappeared following upon the drainage operations carried out in connection with building. *Stegomyia* on the other hand find ideal conditions in the town and breed in alarming numbers. A fever which is probably dengue causes severe epidemics, and must be transmitted by *S. fasciata*, since *Phlebotomus* has not been observed in the town.

STOCKMAN (S.). **Louping-ill.**—*Jl. Comp. Path. Therapeut., London*, xxxi, no. 3, 30th September, 1918, pp. 137–193, 10 figs.

While previous experimental evidence, recorded in an earlier paper by the author, was against the view that louping-ill in sheep might be carried by ticks, it was realised that the possibilities of this theory had not been exhausted, and further experiments have recently been carried out. These prove that larvae of *Ixodes ricinus* from females which as adults engorged on affected sheep can give rise to a highly febrile and sometimes fatal disease in other sheep, when put to feed upon them in very large numbers, and that adults fed as nymphs on affected sheep may have the same effect. The apparently negative results recorded in an earlier paper may have been due to the fact that only a small proportion of ticks become carriers of infection. Ticks allowed to engorge upon sheep undergoing experimental inoculation were found capable, after moulting to their next stage, of causing the disease in other sheep upon which they were put to feed. It is evident that the infective agent can be transmitted from the female ticks through the eggs to the next generation of larvae, but it is not conclusively proved that ticks in their nymphal stage can transmit the disease. It follows almost certainly from the fact of ticks transmitting the infection that the infective agent is a protozoan parasite. The blood of a sheep that has recovered from the disease produced either by inoculation or in natural manner does not continue to be infective by inoculation to others, and it is therefore unlikely that ticks can infect themselves from such animals.

The cure, prevention and eradication of the disease is discussed. Drugs that have proved more or less successful in treating similar diseases were tried, but were invariably ineffective. It is possible, however, that an anti-serum with curative properties may be prepared, and investigations in this direction are being carried on. Serum treatment is not promising in dealing with this class of disease. Prevention of the disease by inoculation in the field is rather more promising and arrangements are being made for practical tests of this method. Eradication of ticks would reduce louping-ill to a negligible factor. The seasonal incidence arises from the fact that ticks infected on sheep in the spring have hatched out or moulted by the autumn and are capable of infecting other sheep; those ticks infected in the autumn are in a position to infect other sheep in the following spring. The isolated cases that may occur at other times are due to infected and fasting ticks that previously failed to obtain a vertebrate host. The

methods of eradication will be dealt with more fully in a later article. The possibilities mentioned in this paper include starving out the ticks. As, however, it has been shown that *I. ricinus* can live for a year or more without food this method is not promising. It does not follow, however, because ticks retain viability for long periods that they necessarily retain infectivity; this is one of the subjects for further investigation. If it can be proved that infected ticks lose their infectivity by feeding on non-susceptible animals, it would be possible to get rid of infection by removing sheep from the pastures and substituting other stock for one or two seasons. The difficulty then arises that most of the infected pasture is unsuitable for other stock than sheep. It is hoped to reduce the number of ticks greatly by dipping the sheep at short intervals, such as five days. This should be done during the seasonal incidence of louping-ill; it is feared, however, that among sheep affected with the disease the number of severe or paralytic cases might be increased owing to the dipping. It is thought that tick eradication may best be obtained by a combination of the above methods and trials in the field are being organised to determine this.

LIONNET (F. E.). **Report on the Work of the Veterinary Division.**—*Ann. Rept. Dept. Agric. for 1917, Mauritius*, pp. 12–13. [Received 31st October 1918.]

Two fatal cases of piroplasmosis were recorded in milch cows during the year.

The importance and necessity of dipping tanks is becoming more and more known and appreciated, many estates having already constructed their tanks and being satisfied with the results obtained. This is an important step towards the improvement of cattle-rearing in Mauritius, especially in tick-infested districts.

The Construction of Dipping-tanks.—*Dept. Agric. Mauritius*, Leaflet no. 6, 14th March 1918, 2 pp., 3 figs. [Received 31st October 1918.]

This leaflet gives full instructions for the erection of a dipping-tank, with a ground plan, cross section and longitudinal section drawn to scale, and the estimated cost of construction.

SIGWART (H.). **Beitrag zur Zeckenkenntnis von Deutsch-Südwestafrika, unter besonderer Berücksichtigung der Funde in den Bezirken Outjo und Waterberg.** [The Ticks of German South-west Africa, with Special Reference to Species found in the Districts of Outjo and Waterberg.]—*Zeitschr. f. Infektionskr., parasitäre Krankheiten u. Hyg. der Haustiere, Berlin*, xvi, no. 6, 1st June 1915, pp. 434–444, 6 figs., 1 map.

These investigations were made from September 1912 to May 1914. The rapid multiplication of ticks in this part of Africa is hindered

by the sharp differentiation between the rainy and dry seasons. In the districts visited the rains lasted from about the beginning of December to the end of April, the average rainfall varying from 4 to 28 inches according to the locality. In western Outjo 16 inches may be taken as a very good rainfall. This moderate amount of moisture is followed by a dry period of from six to seven months. Furthermore the night temperatures from May to August often drop to 0° C. [32° F.] and sometimes still lower. Thus even during the months when ticks were most numerous, from February to April, they were not obvious on horses, cattle and other mammals. In the dry season (May to September) many domestic animals and wild game especially are entirely free from ticks.

The following ticks are recorded, together with particulars of their morphological characters and prevalence :—Argasidae : *Argus persicus*, abundant in most fowl houses. Ixodidae : *Aponomma exornatum*, found in one locality. *Hyalomma aegyptium*, equally distributed throughout the region visited. It was chiefly found, always in the adult stage, on equines including zebras, cattle, sheep, goats, oryx antelopes, small antelopes, wild pigs, dogs and man. *Rhipicephalus evertsi* var. *mimeticus*, Dön., is a very common tick on horses, cattle, sheep and goats. Nymphs were also taken from cattle. As its external characters have never been described, except very briefly by Dönitz, they are dealt with here. *R. oculatus* is widely distributed. Its chief host is the hare, others in order of decreasing importance being small antelopes, sheep, goats, dogs, equines including zebras, and cattle. Nymphs were found on a dog and an ox. *R. sanguineus* was found in two localities. The dog is the chief host, others being equines, wild pigs and sheep. *Rhipicentor bicornis* is a parasite of canine animals; it was never found on goats. The specimens were always somewhat smaller than as described by Dönitz after Nuttall and Warburton. One female of *Haemaphysalis leachi* was taken from a dog. On the whole, ticks in this region cause much less damage than in other countries, chiefly owing to their small numbers.

Swellengrebel (N. H.). **De Anophelinen van Nederlandsch Oost-Indië.** [The Anophelines of the Dutch East Indies.]—*Koloniaal Instituut te Amsterdam*, Meded. no. vii, Afdeeling Trop. Hygiene no. 3, 1916, 182 pp., numerous text-figures, 16 plates. Price fl. 4.50. [Received 6th November 1918.]

This detailed review of the Anophelines found in the Dutch East Indies has been published in consequence of the literature on the subject being very complicated owing to the lack of agreement between the work of Dönitz and Theobald, and the author hopes that it will assist to render civil medical officers in the Dutch East Indies independent of European specialists in the identification of the various species concerned. The structure of the Anophelines is described and keys are given to the species known from the Dutch East Indies, as well as to the more important ones from south-eastern Asia. Practical hints on identification are added and the bulk of the volume is occupied with descriptions of the various genera and species.

DOTEN (S. B.). **Department of Entomology.**—*Ann. Repts. Board of Control for Year ending 30th June 1915, Univ. Nevada Agric. Expt. Sta., Reno*, 1916, pp. 38–39, 1 fig. [Received 14th November 1918.]

The possibility of the survival of the bed-bug [*Cimex lectularius*] in bunk-houses throughout the winter, in spite of starvation and cold weather, has been made the subject of a series of experiments by Mr. Schweis. It was found that examples taken on 21st January and placed in tubes in a box which was kept under shelter in the open air till 10th April, and which were then placed in tubes in a tin box, packed in cotton, and stored in a refrigerator at a constant temperature of 40°–50° [F.] emerged on 1st July, alive and vigorous. A number of newly-hatched individuals survived after being kept in cold storage for nearly three months without food, and eggs kept under the same conditions hatched promptly when the temperature was raised. Bunk-houses, therefore, should be fumigated before being used again, either with potassium cyanide or with sulphur; in the latter case, two fumigations, a week apart in warm weather, are necessary to effect a complete eradication.

PIERCE (W. D.). **Medical Entomology a Vital Factor in the Prosecution of the War.**—*Proc. Entom. Soc. Washington, D.C.*, xx, no. 5, May 1918, pp. 91–104. [Received 15th November 1918.]

The importance of medical entomology is discussed in its various phases, namely (1) the biological, comprising types of relationships between the disease organism and its host, types of transmission, insect life-histories and the connection between bacteria and insects; (2) the medical, dealing with the importance of insects as vectors of diseases of man and animals; and (3) the sanitary, showing that disease prevention is often synonymous with insect destruction. The paper concludes with the enumeration of some problems still be to worked out.

MOSIER (C. A.) & SNYDER (T. E.). **Notes on Gadflies in the Florida Everglades.**—*Proc. Entom. Soc. Washington, D.C.*, xx, no. 6, June 1918, pp. 115–126. [Received 15th November 1918.]

The flight at dawn of the large gadfly (*Tabanus americanus*, Forst.) at Paradise Key in the Lower Everglades in enormous numbers has been observed for two years. In 1917 it was thought that both sexes were in flight. This year's observations show that most of the swarming flies are males. Owing to the height at which the adults fly, mating has not been observed; all low-flying adults captured have proved to be males. In 1918 the swarm was first observed on 9th March and ended on 10th May.

Males of several species of *Tabanus* congregate in large numbers during the day and feed on the blossoms of the saw palmetto (*Serenoa serrulata*) where the bloom is shaded. *T. lineola*, F., was found swarming at dusk on 10th May, and the night-flying *T. flavus*, Macq., is common. *Diachlorus ferrugatus*, F., a few Tabanid larvae in the water under saw grass, and a number of other Tabanids have been collected at Paradise Key, including *Tabanus americanus* Forst., *T. turbidus*, Wied., *T. trijunctus*, Wlk., *T. melanocerus*, Wied., *T. atratus*, F., *T. quinquevittatus*, Wied., *T. pumilus*, Macq., *Chrysops plangens*, Wied., and *C. flavidus*, Wied.

DUNN (L. H.). **A New Mosquito (*Aëdes whitmorei*) from Colombia.**—*Proc. Entom. Soc., Washington, D.C.*, xx, no. 6, June 1918, pp. 128–130. [Received 15th November 1918.]

Aëdes whitmorei, sp. n. is described from specimens captured at Muzo, Colombia. Other examples were bred from larvae taken from a small, heavily shaded pool of clear, but apparently stagnant, water.

HEADLEE (T. J.). **The Problem of Mosquito Control.**—*48th Ann. Rept. Entom. Soc. Ontario for 1917, Toronto*, 1918, pp. 49–59. [Received 16th November 1918.]

Anti-mosquito work in New Jersey does not aim primarily at the elimination of disease, since malaria occurs only in a few limited areas and is in each case a strictly local problem. The State contains, however, some 296,000 acres of salt marsh, large portions of which are gradually being reclaimed for urban properties or seaside communities, while most of it is potentially good salt-hay land. Mosquito control therefore has for its object the comfort and well-being of the citizens. The problem of control alone can be considered under existing conditions; that of extermination must be relegated entirely to the future. Plans for analysing the mosquito fauna of a district or State and for making a map of infested districts are outlined. Wherever the charts show the presence of invasions, these must be traced to the source from which they come [see this *Review*, Ser. B, v, p. 141]. Examinations of a sewage-charged salt marsh showed enormous numbers of *Culex salinarius* and *C. pipiens*, with small numbers of *Ochlerotatus* (*Aëdes*) *sollicitans* and *O.* (*A.*) *cantator* in larval and pupal stages. The majority of the mosquitos found in houses were *C. salinarius*, with a smaller number of *C. pipiens* which had evidently migrated a distance of $2\frac{1}{2}$ miles from their breeding-place. The charts should show the mosquito breeding-grounds and a seasonal map of the more or less permanent breeding-places ought to be made. Plans for the elimination of these haunts, which consist largely of drainage problems, should then be prepared and efforts made to obtain and organise co-operation of the persons interested and if possible financial help from the public treasury. It is important, when the initial work has been completed, that it be maintained. With the present methods the protected territory will at times be troubled by some mosquitos, because the enormous increase in breeding surface, brought about by a prolonged rainy period, may be such as the organisation cannot cope with. Some statistics are given computing the value of mosquito control as shown by results.

BAKER (A. W.). **The Effect of Stable and Horn Fly Attacks on Milk Production.**—*48th Ann. Rept. Entom. Soc. Ontario, for 1917, Toronto*, 1918, pp. 91–93. [Received 16th November 1918.]

In a previous paper the author discussed some repellents for stable flies [*Stomoxys*] and horn flies [*Lyperosia*] on cattle [see this *Review*, Ser. B, v, p. 187]. During 1917 spraying experiments have been carried out in order to discover the effect of fly attacks on milk production and the benefit to be derived from a prevention of these. The results showed remarkable benefit from spraying, treatment before the morning

milking giving the best results. In certain periods of the test the use of a repellent produced an increased milk supply of from 4 to 6 per cent. The repellent used consisted of 1 U.S. gal. each of kerosene, slightly sour milk, fish-oil and strong hot soap solution made from about ½ cake laundry soap, with the addition of 6 oz. citronella oil. The kerosene and milk are emulsified, then the fish-oil and soap solution separately; these two are then thoroughly mixed and the oil stirred in when cold. One gallon of this stock is used to two of water.

Dyar (H. G.) & Barret (H. P.). **Descriptions of hitherto unknown Larvae of *Culex* (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus, Washington, D.C.*, vi, no. 7–9, July–September 1918, pp. 119–120.

The larvae dealt with in this paper are those of *Culex peccator*, D. & K., and *C. floridanus*, D. & K. The former were found in fairly large numbers associated with *C. saxatilis*, Grossb., beneath the overhanging bank of a stream and in small pools in marshy ground.

The larvae of *C. floridanus*, not previously recorded as occurring further north than Georgia, were found in very small numbers in a temporary rain-pool, their scarcity being probably due to the presence of predaceous larvae. They somewhat resemble *Psorophora discolor*, with which they occur, and have the same habit of lying inverted at the bottom of the pool.

Dyar (H. G.). **New American Mosquitos (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus, Washington, D.C.*, vi, no. 7–9, July-September 1918, pp. 120–129.

The new species dealt with in this paper are:—*Wyeomyia aphobema*, the larvae of which were found in Bromeliaceae in March in Surinam; *Culex surinamensis*, bred from larvae in a rock pool and in a water barrel in March in Surinam; *Culex usquatus*, many larvae of which were found in Surinam, in very dirty puddles, water barrels, etc., sometimes preyed upon by *Lutzia albostigma*, and always found breeding near houses in February; *Culex* (*Melanoconion*) *zeteci*, from the Canal Zone, Panama, in January; *Culex* (*M.*) *dunni*, from Panama, bred from larvae associated with *Pistia*; *Culex* (*Choeroporpa*) *tecmarsis*, taken at light in Panama in May and June; *C.* (*Helcoporpa*, subgen. n.) *menytes*, from Panama in March; *C.* (*Mochlostyrax*) *alogistus*, from Surinam, bred from larvae in temporary pools, lying on their backs on the bottom; *Psorophora ctites*, taken in Texas in August; *Aëdes* (*Ochlerotatus*) *eucephalaeus*, bred from larvae lying on their backs on the bottom of temporary rain-pools in sandy land, Surinam, in March; *A.* (*O.*) *camposanus* from Ecuador; and *A.* (*Taeniorhynchus ?*) *thelcter* from Texas in August.

Dyar (H. G.). **Notes on American *Anopheles* (Diptera, Culicidae).**— *Insecutor Inscitiae Menstruus, Washington, D.C.*, vi, no. 7–9, July-September 1918, pp. 141–151.

The view is expressed that the genera of *Anopheles* erected by Theobald and others and based on scale-characters, which have been abandoned by some recent writers, should be retained as subgenera.

There are eleven (including *Kerteszia*) such subgenera occurring in America, viz. :—*Coelodiazesis*, D. & K., represented by one species, *A.* (*C.*) *barberi*, Coq., from the eastern United States, the larvae being found in tree-holes.

Anopheles, Meig., represented by 10 species :—*A. eiseni*, Coq., from tropical America, the larvae in tree-holes and pools in rocks ; *A. pseudopunctipennis*, Theo., from tropical America and the adjacent warmer temperate regions, the larvae in permanent ground-pools ; *A. punctipennis*, Say, from southern Canada and the United States to Central Mexico, the larvae in ground-pools, both permanent and temporary ; *A. crucians*, Wied., from the south-eastern United States and Greater Antilles, the larvae in ground-pools, especially near the coast; *A. quadrimaculatus*, Say, from North America, east of the Rocky Mountains, the larvae in permanent swamps, especially connected with rivers ; *A. occidentalis*, D. & K., in North America west of the Rocky Mountains and eastward through Canada to Maine, the larvae in ground-pools of permanent character ; *A. atropos*, D. & K., from Florida Keys and Gulf Coast, the larva unknown ; *A. walkeri*, Theo., in eastern North America, the larvae in fluctuating swamps along rivers, filled by flood-water ; *A. vestitipennis*, D. & K., from Mexico, Central America and Greater Antilles, the larva unknown ; and *A. annulipalpis*, Arrib., from Argentina, the larva unknown.

Dendropaedium, D. & K., represented by 4 species :—*A.* (*D.*) *bellator*, D. & K., from Trinidad, the larvae in Bromeliaceae ; *A.* (*D.*) *cruzii*, D. & K., from Brazil, the larvae in Bromeliaceae ; *A.* (*D.*) *hylephilus*, D. & K., from Venezuela, Ecuador and Panama, the larva unknown; and *A.* (*D.*) *neivai*, H. D. & K., from Panama and southern Mexico, the larvae in Bromeliaceae.

Cyclolepteron, Theo., with one species, *A.* (*C.*) *grabhami*, Theo., from the Greater Antilles, the larvae in ground-pools.

Stethomyia, Theo., with one species, *A.* (*S.*) *nimbus*, Theo., from British Guiana and Brazil, the larva unknown.

Arribalzagia, Theo., represented by 7 species :—*Anopheles* (*A*) *intermedius*, Chagas, from Brazil, the larva unknown ; *A.* (*A.*) *punctimacula*, D. & K., from Panama, the larvae in ground-pools ; *A.* (*A.*) *mediopunctatus*, Theo., from Trinidad and Brazil, the larva unknown ; *A.* (*A.*) *maculipes*, Theo., from Brazil, the larvae in ground-pools ; *A.* (*A.*) *pseudomaculipes*, Chagas, from Brazil, the larva unknown ; *A.* (*A.*) *apicimacula*, D. & K., from Mexico, Central America, and Trinidad, presumably also the northern coast of South America, the larvae in pools in stream-beds ; and *A.* (*A.*) *strigimacula*, D. & K., from Tropical Mexico, the larvae in pools in stream-beds.

Kerteszia, Theo., with one species, *A.* (*K.*) *boliviensis*, Theo., from Bolivia, the larva unknown.

Myzorhynchella, Theo., represented by 4 species :—*A.* (*M.*) *lutzi*, Cruz, *A.* (*M.*) *parvus*, Chagas, *A.* (*M.*) *nigritarsis*, Chagas, and *A.* (*M.*) *gilesi*, Neiva, all from Brazil, the larvae unknown.

Chagasia, Cruz, with one species, *A.* (*C.*) *farjardi*, Lutz, from Brazil, the larva unknown.

Manguinhosia, Cruz, with one species, *A.* (*M.*) *peryassui*, D. & K., from Brazil, the larva unknown.

Cellia, Theo., represented by 5 species :—*A.* (*C.*) *argyrotarsis*, R. D., from the tropical American mainland and Lesser Antilles, the larvae

in ground-pools and artificial receptacles; *A.* (*C.*) *pictipennis*, Phil., from Chile and Argentina, the larva unknown; *A.* (*C.*) *braziliensis*, Chagas, from Brazil, the larva unknown; *A.* (*C.*) *tarsimaculatus*, Goeldi, from the tropical American mainland and Lesser Antilles, the larvae in any kind of ground-pools except artificial ones; and *A.* (*C.*) *albimanus*, Wied., from tropical America, including the greater Antilles and southern Florida, the larvae in ground-pools, often of brackish water.

Headlee (T. J.) & Beckwith (C. S.). **Sprinkling Sewage Filter Fly, *Psychoda alternata*, Say.**—*Jl. Econ. Entom. Concord, N.H.*, xi, no. 5, October 1918, pp. 395–401.

Psychoda alternata, a small, light-coloured, moth-like fly has proved to be a serious nuisance wherever sprinkling filters have been utilised for the purification of sewage, penetrating into houses situated ¾ mile or less from the sewage plant, and being popularly accredited with carrying various infectious diseases.

The eggs are laid upon the surface of the stones in the filter bed in irregular masses of from 30 to 100, and hatch in from 32 to 48 hours at a temperature of 70°F. The larvae on hatching make their way into the film, where they thrust their breathing tubes through the film itself and exist in much the same manner as mosquito larvae. They are present throughout the filter from top to bottom, but most abundant in the zone from 3 to 12 inches below the surface. The larval stage lasts from 9 to 15 days, and the pupal from 20 to 48 hours at a temperature of 70° F. With the beginning of warm weather the flies emerge from the over-wintering larvae and pupae in such immense numbers as to inconvenience those working at the filter beds, but with the breaking-down and sloughing-off of the over-wintering film, the flies rapidly disappear. As the summer film becomes heavier the flies increase in abundance, until in August they reach a density greater than that of spring, their abundance being thus correlated with the thickness of the film, within which, and on which, the larvae feed.

Experimental attempts to control this pest in the larval and pupal stages by means of insecticides such as borax, hypochlorite of lime, stone lime, copper sulphate, iron sulphate, pyrethrum, carbon bisulphide, Black-leaf 40 and a saturated solution of hellebore, showed that, in general, the minimum dosage for the fly was destructive to the film. The most promising of the above substances, hypochlorite of lime, destroyed only 85 per cent. of the larvae and considerably injured the film.

The placing of a stone from the filter bed in water over-night to await examination in the laboratory next day, accidentally led to the discovery that 100 per cent. of the larvae and pupae are killed by drowning in 24 hours. This was confirmed experimentally by submerging the sprinkling sewage filter for 24 hours with the ordinary sewage, the results showing that by this simple means *P. alternata* and the less important allied species, *P. cinerea*, may be completely destroyed without in anyway impairing the film upon which the efficiency of the sprinkling sewage filter depends.

DYAR (H. G.) & KNAB (F.). **Bromelicolous *Anopheles*—a Correction (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vi, no. 7–9, July-September 1918, pp. 140–141.

It appears that the earlier identification of *Kerteszia boliviensis*, Theo., with *Anopheles lutzi*, Theo., *nec* Cruz (*A. cruzi*, D. & K.) is an error. *Kerteszia* is still unknown in nature, but it evidently cannot be used as a subgeneric name for the bromelicolous species of Anophelines, and for these the name *Dendropaedium* is suggested, based on the character of the hairs and scales of the thorax and abdomen.

EWING (H. E.). **The Use of Palliatives for Mosquito Bites.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 5, October 1918, pp. 401–404.

This paper records an experimental investigation into the remedial qualities of the different chemicals that have been suggested as palliatives for mosquito bites. A table shows the results of tests with soap, bay rum, 95 per cent. alcohol, 30 per cent. alcohol, hydrogen peroxide, glycerine, concentrated and weak solutions of ammonia, and indigo in water. Of these, soap, bay rum, dilute alcohol and ammonia have slight value. Strong alcohol and strong ammonia have the greatest value as palliatives, both giving a marked reduction in pain. The former is apt to leave a hardened lump, while the latter is rather harsh on the skin.

HUTCHINSON (R. H.). **A Note on the Life Cycle and Fertility of the Body Louse (*Pediculus corporis*).**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 5, October 1918, pp. 404–406.

A table is given recording the rate of development and of deposition of eggs of the body-louse, *Pediculus humanus* (*corporis*), at body-surface temperature with unlimited opportunities for feeding. This fully confirms the data given by Nuttall [see this *Review*, Ser. B, vi, p. 19], but shows a higher record of oviposition than any previously published. A total of 276 eggs were deposited during a period of 25 days, or an average of 11 per day with a maximum of 14 eggs in 24 hours.

WALTER (E. V.). **Experiments on Cockroach Control.**—*Jl. Econ. Entom., Concord, N.H.*, xi, no. 5, October 1918, pp. 424–429.

The results of experiments undertaken by the Iowa Agricultural Experiment Station in the summer of 1917 on the control of *Phyllodromia* (*Blattella*) *germanica* and *Blatta orientalis* may be summarised as follows:—(1) Traps may be used as a means of control, but cannot be relied on as a method of extermination. (2) Boric acid is a safe and economical material to use, as it is non-poisonous to human beings and yet very effective against cockroaches. (3) A mixture of equal parts of powdered borax and powdered sugar ground together is effective against cockroaches, is safe and economical, although slower in action than boric acid. (4) Cockroaches eat these substances in an effort to keep clean and not for any possible food value.

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GIBSON (A.). **The Value of High Temperature for Controlling the Common Bedbug.**—*Agric. Gaz. Canada, Ottawa,* v, no. 10, October 1918, pp. 949–951, 2 figs.

During the summer of 1918 a four-roomed cottage at Ottawa, which was badly infested with bed-bugs, was successfully treated by superheating.

The windows having been made air-tight, heat was supplied by two plasterer's stoves. On the day on which the experiment was made, the outside temperature at 4 p.m. was 60·4° F. The fires were started at noon, high temperatures (120°, 115°, 165° and 140°) being reached in all the rooms by 4 p.m. At 8.30 p.m. the fires were checked, but not put out and the temperatures continued high for at least an hour after that time. At 6.30 p.m. a thorough examination of the premises showed absolutely no sign of life, a large number of dead bugs being found lying on the bedroom floors. This result confirms previous experimental work as to the effect of heat on bed-bugs.

SEN (S. K.). **Beginnings in Insect Physiology and their Economic Significance.**—*Agric. Jl. India, Pusa,* xiii, no. 4, October 1918, pp. 620–627.

Investigations on mosquito larvae with regard to osmosis have shown that equi-molecular solutions of cane-sugar and common salt act differently on them. Thus 12 larvae in 15 c.c. water containing 3 gm. sugar all died in from 9 to 22 hours; 12 larvae in 15 c.c. water containing ½ gm. salt (sea-water strength) all died in about 3 hours; while in a mixture of equal parts of the above solutions they were mostly dead in 9 hours.

As regards the respiration of mosquitos, experiments have shown that larvae and pupae enclosed with a known quantity of air consume the whole amount of the oxygen present before dying, thus indicating the thoroughness with which remedial operations on the principle of deprivation of free air must be carried out.

Little is known of the nature of the digestive secretions of insects, but the fact that mosquito larvae thrive on Sanatogen, a glycerophosphate of casein, suggests that protein is necessary for their tissue formation. However, on the other hand, it may be that they thrive at the expense of bacteria present as the result of putrefaction due to the introduction of Sanatogen. The fact that the protein requirements of some insects is practically nil is proved by their being able to live on a solution of simple carbohydrate, such as cane-sugar. The liking shown by many insects, such as mosquitos, for sugar makes it difficult to understand why these insects should exhibit a liking for two such dissimilar substances as blood and sugar, the percentage of dextrose in blood being too small to impart a sweet taste, especially in the presence of so many inorganic salts. Experiments have established the following conclusions:—(1) Warmth, though it actuates the mosquito to bite, does not encourage it to suck; (2) the salinity of blood is not what induces it to suck; (3) sugar in blood is not what induces it to suck; (4) shed goat's blood is not attractive to mosquitos.

The hypothesis that blood is necessary for ovulation in mosquitos is contradicted by the fact that freshly emerged females of *Stegomyia*

albopicta (*scutellaris*) have oviposited after being fed on meals of milk, peptone sweetened with cane-sugar, or on meals of cane-sugar only.

It is probable that the presence of a food-odour is an important factor in attracting insects; in the case of mosquitos the odour is probably that of the secretion of the sebaceous glands. Thus *Dacus* is similarly attracted by methyl eugenol, the larva of *Chrysomyia* (*Pycnosoma*) *flaviceps* by the odour of night-soil, and the adults by the spirit smell of *Bassia latefolia* (mohwa).

FOSTER (M. H.). **Preliminary Report on Carbon Tetrachloride Vapour as a Delousing Agent.**—*U. S. Public Health Repts., Washington, D.C.*, xxxiii, no. 43, 25th October 1918, pp. 1823–1827.

Dry and moist heat and hydrocyanic acid gas, though effective as a means of destroying body-lice on clothing, require the use of somewhat complicated apparatus, which is not easily transported nor suitable for cleaning infested clothing in gaols, small hospitals, asylums, etc.

Investigations on the effects of carbon tetrachloride vapour as a practical method of destroying lice which can be easily applied and does not injure woollen fabrics have shown it to be a most efficient and convenient means of killing lice on clothing. As an insecticide it appears to be very toxic, the pure vapour killing unprotected lice in 15 minutes, though failing to destroy them in 10 minutes.

The method used for delousing soldiers' clothing was as follows:—Each article was fairly firmly rolled up and placed in a 10 gal. tin can, 19 ins. high, 12 ins. in diameter, sheathed with a light wood covering and weighing 5½ lb. A soiled shirt, badly infested with lice, was cut into 4 pieces, each piece being tightly rolled and then wrapped in 10 thicknesses of ordinary sheeting. These were placed in the container amongst the complete clothing of a soldier and the whole contents firmly compressed so as to occupy a little more than half the total space. Several layers of filter paper were laid on the top of the clothing and 25 c.c. carbon tetrachloride was poured on this and the top of the can was covered by several thicknesses of towelling. A loose cover was placed over this to protect the can from draughts while allowing the air displaced by the heavy vapour to escape. At the end of two hours when the can was opened and the clothing aired and examined, all the lice were found to be dead.

The quantities of carbon tetrachloride required with 2 hours' exposure are as follows:—For 100 cu. ins. of space, 2 c.c.; for 231 cu. in. (1 U.S. gal.) 4·5 c.c.; for 1 cu. ft., 30·5 c.c. The tests were made at temperatures ranging from 68° to 72° F., being approximately those of artificially warmed living rooms even in winter. It is essential that the container should be air-tight, about twice as high as broad, and only ⅔ full of clothing, as the vapour appears to be easily disseminated from shallow or broad receptacles. It was definitely determined that the above proportions are useless against the eggs; in one test the use of 150 c.c. of the chemical per cubic foot of space prevented the eggs from hatching after 8 hours' exposure, though a few of them hatched after one of 4 hours.

In considering the applicability of carbon tetrachloride as a delousing agent, the possible danger to human life must be borne in mind, as it is slightly more poisonous to human beings than chloroform.

Göldi (E. A.). **Darmkanal und Rüssel der Stubenfliege vom sanitarischen Standpunkte aus.** [The Intestine and Proboscis of the House-Fly from the Sanitary Point of View.]—*Mitt. Schweiz. Entom. Ges., Berne*, xii, no. 9–10, December 1917, pp. 418–431, 3 figs.

Some description is given of the anatomy of the house-fly [*Musca domestica*], more particularly of the mouth-parts and intestine. It is pointed out that house-flies play a twofold part as mechanical carriers of disease germs. In the carriage of germs attached to the exterior of its body the rôle is a passive one, but a more active part is played by the intestine. It may be assumed that under normal conditions the house-fly is the vector of typhus abdominalis, cholera, dysentery, epidemic diarrhoea, tuberculosis, anthrax, framboesia tropica, and ophthalmia.

Van Es (L.) & Schalk (A. F.). **Sur la Nature anaphylactique de l'Intoxication parasitaire.** [On the Anaphylactic Nature of Parasitic Poisoning.]—*Ann. Inst. Pasteur, Paris*, xxxii, no. 7, July 1918, pp. 310–362.

In a notice of this paper published in this *Review*, Ser. B, vi, p. 209, it is not made clear that the conclusions given are those of MM. Seyderhelm and that the authors themselves disagree with them, both as a result of their own experiments and because the foci of equine pernicious anaemia are more or less limited, whereas flies of the genus *Gastrophilus* are universally distributed.

Cameron (A. E.). **Warbles and Bots.**—*Tenth Ann. Rept. Quebec Soc. Protection Plants from Insects and Fungous Diseases, 1917–1918*; *Quebec*, 1918, pp. 21–39. [Received 23rd November 1918.]

This paper gives a popular account of the warble-flies, *Hypoderma bovis*, DeG., & *H. lineatum*, Vill., and of the bot-flies, *Gastrophilus intestinalis*, DeG., *G. nasalis*, L., and *G. haemorrhoidalis*, L.

Bodet (—). **Note sur quelques Cas de pseudo-Myiase rampante ou pseudo-Draconculose, observés à Tamatave.** [A Note on some Cases of creeping pseudo-Myiasis or pseudo-Draconculosis observed at Tamatave.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 8, 9th October 1918, pp. 716–722.

Several cases are recorded of a curious skin affection of indeterminate origin which the author has had under observation at Tamatave, Madagascar. The disease is popularly ascribed to "Senegalese worm," and while it is apparently caused by some parasite, the species implicated is unknown. Possible parasites that might be concerned are a Dipterous larva, a Sarcoptid mite or some such insect as *Dermatophilus* (*Pulex*) *penetrans*. The author is inclined to accept the last possibility, although the cases recorded were observed during the rainy season, when this flea is rare.

M. Roubaud, in commenting upon this paper, remarks that the serpentine dermatose eruption described occurs apparently throughout the tropical zone and is at first glance analogous with the creeping myiases produced by Oestrid larvae. As, however, no parasite has been discovered as the cause of the affection, the real nature of the disease remains to be elucidated.

ROUSSEAU (L.). **Un Cas de Parasitisme vulvo-vaginal par un Acarien Sarcoptide au Cameroun.** [A Case of vulvar-vaginal Parasitism by a Sarcoptid Mite in Kamerun.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 8, 9th October 1918, pp. 722–724.

The case is recorded of infestation of a child of 3½ years by a Sarcoptid mite, the species in question being *Tyroglyphus siro*, L.

CORDIER (E.). **Capture en Argonne d'*Anopheles nigripes*, Staeger, 1839, Espèce nouvelle pour la Faune française.** [The Capture in Argonne of *Anopheles nigripes*, Staeger, 1839, an Addition to the French Fauna.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 8, 9th October 1918, pp. 726–727.

The capture of *Anopheles plumbeus*, Hal. (*nigripes*) in August and September in the forest of Argonne is recorded.

LANGERON (M.). **Présence de l'*Anopheles nigripes*, Staeger, 1839, dans la Région parisienne.** [The Presence of *Anopheles nigripes*, Staeger, 1839, in the District of Paris.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 8, 9th October 1918, p. 728.

A single female example of *Anopheles plumbeus* (*nigripes*) is recorded from Bourg-la-Reine in the southern outskirts of Paris in September 1918. The individual in question was taken in a house, although this species is reputed not to penetrate into habitations.

LACAZE (H.). **Note au Sujet de l'Hibernation des Larves de Moustiques en Macédoine.** [Note on the Hibernation of Mosquito Larvae in Macedonia.]—*Bull. Soc. Path. Exot., Paris,* xi, no. 8, 9th October 1918, pp. 729–730.

During a spell of cold weather in Macedonia from 4th to 12th December 1917, many mosquito larvae were observed embedded in the ice covering stagnant water in Salonika and the surrounding country, while numerous individuals could be seen in the unfrozen water underneath. On 12th December after the cold had passed and thaw set in, living larvae were collected from the same spots; these comprised *Anopheles* (*Pyretophorus*) *palestinensis*, Theo., *Culex pipiens*, L., and one larva of *Uranotaenia unguiculata*, Edw. These species can evidently hibernate in Macedonia in the larval form. It is considered probable that *U. unguiculata* has been accidentally imported into Macedonia but has not properly established itself there, in view of its extreme rarity in 1918.

FRANÇA (C.). **Note sur les Espèces portugaises du Genre *Phlebotomus*.** [Note on the Portuguese Species of the Genus *Phlebotomus*.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 8, 9th October 1918, pp. 730–733, 3 figs.

As the great epidemic that raged in Spain and Portugal in 1918 had all the characteristics of sand-fly or three-day fever, a further study was made of the species of *Phlebotomus* occurring in Collares and Porto. Besides *P. papatasii*, which was found there in 1912 and 1913, a great many individuals belonging to two other species have been observed in 1918; one of these is *P. sergenti*, Parrot, hitherto known only from male specimens, the female of which is described, and a new species resembling *P. legeri*, Mansion, which is here described under the name *P. lusitanicus*.

TEISSONNIÈRE (—), BÉGUET (—) & JOLLY (—). **Observation d'une Epidémie de Grippe à l'Armée d'Orient (mai-juin 1918).** [Observations on an Epidemic of Influenza in the Balkan Army (May-June 1918).]—*Bull. Soc. Path. Exot., Paris*, xi, no. 8, 9th October 1918, pp. 738–744.

The suddenness of the outbreak of the influenza epidemic in the Balkan Army in May–June 1918, the knowledge of the endemicity of three-day fever in Macedonia, and the discovery of *Phlebotomus* in several localities, were the causes of mistakes in diagnosis at the beginning of the epidemic. The determination of the incubation period, however, the close relation between the pulse and the temperature, and the undoubted absence of any insect bite in many cases, quickly disposed of the diagnosis of sand-fly fever in favour of that of influenza, which was soon confirmed by the serious pulmonary complications that in some cases proved fatal.

ROUSSEAU (L.). **Maladies parasitaires à Douala (Cameroun).** [Parasitic Diseases at Duala (Kamerun).]—*Bull. Soc. Path. Exot., Paris*, xi, no. 8, 9th October 1918, pp. 744–759.

Among the parasitic diseases recorded at Duala are malaria, of which a separate account has been given [see this *Review*, Ser. B, vi, p. 140]. Sleeping sickness, though occurring with severity in the vicinity of Duala, has only been observed on three occasions within the town and two locally-acquired cases are described. Animal trypanosomiasis is common among cattle and sometimes among dogs, and cases have also been observed among mules and horses. Tsetse-flies are rare in the town, but are occasionally found; the species captured include *Glossina palpalis*, *G. pallicera* and *G. fusca*, the first-named only having been observed in houses. Filariasis appears to be general among the native population; *Filaria loa* seems to occur most frequently, but *F. volvulus* has also been taken from a thoracic tumour on a native. Elephantiasis is also common. Parasitic insects causing skin diseases are common both among Europeans and natives; the jigger flea [*Dermatophilus penetrans*] is of frequent occurrence; lice are represented almost entirely by *Pediculus capitis*; one case of skin infestation by a young larva of the fly, *Cordylobia anthropophaga*, is recorded.

LACAZE (H.). **L'Etude des Réservoirs de Virus malarique indigènes en Macédoine.** [The Study of native Reservoirs of the Malaria Virus in Macedonia.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 8, 9th October 1918, pp. 759–772.

The first prophylactic step towards reducing the native reservoirs of the malaria virus in a given area must be the determination of the intensity of infection in the villages of that region. The two methods by which this can be done are by the search for the malarial parasite in the peripheral blood, and by determination of the endemic spleen index. The relative merits of these two methods are discussed, the author being decidedly in favour of the second. The most reliable index is obtained by examination of children between the ages of 18 months and 10 years; prior to the minimum age, the child has been less exposed to insect bites and the spleen has not had time to show reaction to malarial infection; after the maximum age, a certain immunity to, or tolerance of the virus makes it more difficult to discover. A table shows the results of three examinations of all the cases showing a positive reaction out of 184 children examined. The results show that all new gamete carriers discovered at the second examination were among those found to be suffering from enlarged spleen during the first examination, thus confirming the malarial nature of the affected spleens. A second table gives a résumé of each of the three examinations, showing the number of cases in which the search for parasites and hypertrophy of the spleen were simultaneously positive, and the number of cases in which one only of the tests proved positive. Another table shows that the number of hypertrophied spleens and the number of positive blood examinations undergo seasonal variations, being higher in November than in June or January. Examinations should therefore be made for preference during the autumn. While the curve of the hypertrophied spleens and that of the positive blood examinations run almost parallel, the former is invariably higher than the latter.

The results of these investigations indicate that even when the parasites are not circulating in the peripheral blood, the spleen, in the case of a native Macedonian child that has not been treated, or has been insufficiently or wrongly treated, remains the touchstone of malarial infection and the evidence of the persistence of the pathogenic protozoa.

La Lucha contra el Paludismo. [The Campaign against Malaria.]—*Boletín Agric. Técnica y Económica, Madrid*, x, no. 117, September 1918, pp. 785–792.

The chief precautions that should be adopted for protection against mosquitos are reviewed. The methods advocated include the usual measures against the bite of the insect, several repellents for application to the skin being recommended. Suggestions for the destruction of the adults include fumigation with sulphuric anhydride, with a mixture of camphor and phenic acid, with cresilol and creolin and with hydrocyanic acid and various other substances. Various culicide solutions are recommended for spraying, and traps for catching the adults are described. Measures against the earlier stages include suppression of the breeding-places, oiling of pools, etc. Instructions for making

the soap larvicide used in Panama are given and various other larvicide preparations are mentioned. The introduction of fish into water reservoirs is also recommended.

Brèthes (J.). **La Mosca Brava.** [*Stomoxys calcitrans.*]—*Anales Soc. Rural Argentina, Buenos Aires*, lii, no. 8, August 1918, pp. 496–498, 2 figs. [Received 27th November 1918.]

A short account is given of the life-history and habits of *Stomoxys calcitrans*, and the importance of cleanliness in stables and places where the fly breeds is emphasised. If a breeding-place of the fly should be discovered, control measures should be based on the fact that the larvae descend into the ground about two inches, rarely more, to pupate. Holes should therefore be drilled with a stake, about 6 to 8 inches deep at intervals of about a yard. Into each sufficient carbon bisulphide should be poured to fill a couple of walnuts [*sic*] and the holes at once filled in. This will penetrate the soil and kill any larvae or pupae within the area treated.

Bacot (A.). **Mosquitoes and the Danger of Malaria in England.**—*Essex Naturalist*, xviii, pp. 241–263, 4 plates, 3 figs. [Received 12th November 1918.]

A brief general account is given of mosquitos, their life-history and habits, particularly those species that are responsible for the dissemination of diseases, a description of these being given and the choice of breeding-places of the various species compared. The history of malaria in England is briefly reviewed, the disease probably having been introduced after the Norman conquest. During the latter half of the 19th century it gradually died down, owing probably in part to improvements in drainage and in part to the use of quinine. The cause for such disappearance in some localities is, however, difficult to determine; in South Essex, for instance, malaria is said to have practically disappeared since the 18th century, although the marshes have been drained for 300 years in the same manner as now. Two charts show respectively the distribution of Anopheline mosquitos and the past occurrence of malaria in England. A comparison of these shows that the distribution of the disease is more restricted than that of the mosquitos. At the outbreak of the War, apart from a few imported cases, malaria was probably extinct. The factors necessary for the continuance of the cycle of the malaria organism are discussed, and it is pointed out that malaria can only exist during the period in which the temperature is high enough to allow the parasite responsible for the disease to develop within the body of the mosquito. Within this limit the survival of malaria will depend upon the period during which the organism can linger on in the system of its human host, coupled with the prevalence of mosquitos when any recrudescence, due to hardship and exposure, occurs. These two factors are amenable to human influence, and as England is situated at the limit of the range of the disease it should not be difficult to control it in this country. The prevention of the infection of mosquitos when a malarial subject has a renewed attack of fever is difficult, but not impossible. If there were a thoroughly organised national medical service the

danger attending such attacks could be minimised, if not prevented; but there is no chance of such a service being available before the troops return from abroad. Cases of malaria in persons who have never been out of the country have already been reported. The Local Government Board is therefore turning to the last line of defence, namely, the control of Anophelines.

Three species of Anophelines occur in England; *Anopheles maculipennis*, the commonest malaria carrier in Europe, *A bifurcatus*, and *A. plumbeus* (*nigripes*). The last-named is rare and of rather unusual habitat. It occurs in Epping Forest, where the larvae have been taken from holes in beech trees, but there is no evidence that this species is able to convey malaria. *A. bifurcatus* is a malaria carrier, but is much less common than *A. maculipennis*.

There is considerable difference between the breeding-places of Anophelines and those of other groups of mosquitos. The former, as typified by *A. maculipennis*, frequent open sunlit water. Small, impermanent and very shallow collections of water such as appear in the holes made by horses' hoofs, or waters that are much obstructed and clogged with weeds, require much more careful attention as breeding-places than the more permanent pools and streams, the latter being generally tenanted by enemies of mosquito larvae while the former are not.

The inventions of man for combating mosquitos are summarised as follows:—The use of mosquito curtains, screening of dwellings, the application of repellents, the destruction of adults by traps, fumigation or spraying, the removal of cover near houses and the cutting of trees, bushes and grass. Control of the larval and pupal stages is effected by drainage of surface-water and swamps, the filling of pools and water-holes, the removal of weeds in streams and ponds, deepening the margins of ponds, filling in of hoof-holes, oiling of water-surfaces and the penalising of persons who allow mosquitos to breed in lily-ponds, rock-gardens, swamps, water-tanks, and other domestic supplies of water, and those who leave about discarded tins and empty bottles. The methods of control must be chosen to suit the conditions of a particular district; it must be considered whether the filling in or oiling of a pool will destroy natural enemies of the mosquito; the time of undertaking the control measures must be duly considered in regard to the time of breeding of the mosquitos. The first steps should be the drainage of swamps (not bogs) and the clearing of ditches to secure a better level and quicker flow. All small temporary collections of water should be filled up or regularly oiled as long as they contain water. Water-tanks and butts should be kept stocked with a few small fish or carefully screened with wire netting. Certain kinds of trapped surface-water drains that afford breeding-places for Culicines should be treated during dry weather with crude naphthaline or disinfectants. The water-holes often found about the roots of old beech trees should be filled in with sand or leaf mould. Larvicides should be carefully chosen. Heavy oils are best in hot climates as they do not evaporate too rapidly; in cool climates light oils can be used and the oil can be emulsified with a soap solution with equally good results; such an emulsion will kill at a dilution of 1 in 20,000. For Anophelines in running water and for any species in salt water, the Panama larvicide, made of crude carbolic acid and resin soap,

may be recommended. Any anti-mosquito campaign in this country should be controlled by a committee of experts; any system leaving the administrative work to local councils directed by leaflets from the Local Government Board is strongly deprecated, as it is considered that this would lead to wastage and unnecessary expense together with weakness on the executive side.

HARTLEY (J. A.). **Notes on an Outbreak of Phlebotomus Fever.**—*Jl. R.A.M.C., London*, xxxl, no. 4, October 1918, pp. 317–318, 1 chart.

In the middle of the summer of 1917 an outbreak of sand-fly fever occurred in a squadron of yeomanry in mid-Egypt, 86·4 per cent. being infected. The first case was discovered on the 37th day of occupation, being followed by 3 or 4 fresh cases daily for a week, with an average of 6 daily in the second week. The camp was then moved to fresh ground about 1½ miles distant, and although it was impossible to avoid carrying the infection, better conditions followed. For military reasons it was desirable to maintain occupation of the first position, and after taking additional preventive measures a guard drawn from another unit was placed in it. Within four days the men showed symptoms of infection and all of them developed the fever. Preventive measures were adopted consisting of cresol spraying, and the use of paraffin oil on breeding-places. Every individual had a mosquito net, but this was of little use owing to the small size of the midges. Examples of *Phlebotomus* were found on walls and in rubble, and required moisture for their breeding-places.

RAWNSLEY (Col. G. T.), CUNNINGHAM (Lt.-Col. R.A.) & WARNOCK (Capt. J.). **The Prophylaxis of Malaria.**—*Jl. R.A.M.C., London*, xxxi, no. 4, pp. 272–276.

In January in Macedonia, both in 1917 and 1918, Anopheline larvae were found, but no pupae; in 1918 very few Anopheline larvae were found in the traps, and none earlier than the middle of May. In 1917 it was considered that primary infections began about 12th June, which the observations as regards larvae will undoubtedly confirm for 1918. The only mosquitos in the earlier months are hibernating and inactive, cases occurring at this period being therefore due to relapses. With the increase of temperature in the summer months cases of malignant malaria occur, which are rare in the winter, the maximum intensity being reached about October or November, from which time it gradually declines, until from March to June such cases are seldom seen. The question has arisen whether *A. palestinensis* (*superpictus*) carries the subtertian parasite entirely or better than does *A. maculipennis*, as it is more prevalent during August and September when subtertian malaria is most in evidence.

HAYES (F. M.). **Hogs and the Tent Caterpillar.**—*Jl. Amer. Vet. Med. Assoc., Baton Rouge, La.*, liv, N.S. vii, no. 1, October 1918, pp. 59–61, 4 plates.

In June 1918 a disease among pigs, suspected at first to be hog cholera, occurred on two small ranches in California. Of two herds

of 47 and 35 respectively, 30 died within two weeks, many of the remainder showing symptoms of sickness. Post-mortem examination revealed the presence in the digestive tract of a continuous string of undigested matter largely composed of a fine, wool-like fibre enclosing bits of grass, barley hulls and small fragments of a dark brown material. On examining the feeding-places, hundreds of cocoons of tent caterpillars [*Malacosoma*] were found, individual fibres of the cocoon being identical with those of the intestinal mass. A number of collected cocoons on being given to a healthy animal were consumed with avidity, the masticated pupae appearing in the intestinal contents as dark brown fragments.

The only treatment adopted was that of keeping the animals away from the infested area until the pupae had emerged, the majority recovering under this treatment.

Ticks "On the Run" in Louisiana.—*Jl. Amer. Vet. Med. Assoc., Baton Rouge, La.*, liv, N.S., vii, no. 1, October 1918, p. 83.

According to Dr. E. I. Smith in charge of tick eradication in Louisiana, the total number of cattle dippings in August was 2,113,386; 84,461 horses and mules were inspected and 32,188 were dipped.

About 5,000 dipping tanks are available in Louisiana, in which 10,518,087 dippings took place under Federal supervision between 15th March 1918 and 1st September 1918, tick-infestation having been thereby reduced to one-tenth of what it was at the beginning of the work in April 1918.

Mohler (J. R.). The Bureau of Animal Industry as a War Auxiliary. —*Jl. Amer. Vet. Med. Assoc., Baton Rouge. La.*, liv, N.S. vii, no. 2, November 1918, pp. 96–107.

On 1st July 1906, 728,565 square miles of territory, involving 15 States, were quarantined for Texas fever, the annual losses from which were estimated at £8,000,000 at least. At this time the belief prevailed generally throughout the South that the tick [*Boophilus annulatus*] could not be exterminated, and though the work of eradication was begun in 1906 in a small way it progressed very slowly for several years owing to limited funds and opposition to the movement. Once it had been proved that extermination was possible, the work progressed rapidly, and up to the present 52 per cent. of the original quarantined area has been declared free.

After the declaration of war, the work was pushed as a war measure, there being 286 Bureau inspectors, 284 State inspectors, and 1,202 county inspectors in the field during the latter part of 1917, and 21,247 dipping vats were in operation.

With the release of the entire State of Mississippi from quarantine in December last, a wedge has been forced through to the Gulf of Mexico, and as the force of inspectors will be increased as much as possible during the coming season, it may safely be predicted that the cattle tick will be completely exterminated in the South within the next five years.

HORSTMAN (E.). **Tick Eradication Talks at New Orleans.**—*Jl. Amer. Vet. Med. Assoc., Baton Rouge, La.*, liv, N.S. vii, no. 2, November 1918, pp. 196–199.

At a conference of the Bureau of Animal Industry employees of Louisiana engaged in cattle fever-tick eradication, held at New Orleans in September 1918, statistics were quoted by Dr. E. P. Flower, of the Louisiana State Live Stock Sanitary Board, showing that tick eradication would mean a grand total increase of profits of £1,706,000 from the improved value of cattle due to dipping, and from the increase in stock and milk supply. Against this the cost of the anti-tick crusade is only £199,000, leaving a net profit of £1,507,000. Tick eradication also makes the introduction of blood-stock possible and safe, and is, in fact, one of the most constructive and conservative measures of the day.

Tsetse Fly in Southern Rhodesia.—*British S. Africa Company, London*, 29th October 1918, 8th November 1918, and 2nd January 1919. [MSS. received from the Colonial Office 8th and 22nd November 1918 and 14th January 1919.]

A further report of the Government Entomologist, supplementary to that already noticed [see this *Review*, Ser. B, vii, p. 9], defines the Sebungwe and Umniati fly areas, as existing in June-July 1918. It is noticed that records of extreme abundance of tsetse-fly [*Glossina morsitans*] in certain spots, with one exception, coincide with localities where game is particularly plentiful. The exception is on the west bank of the Umniati river, where the fly may be associated with the river itself or may be feeding on the troops of baboons that are extraordinarily plentiful there. The fact that game in this neighbourhood has been checked by professional hunters for the past five or six years without a corresponding reduction in the numbers of tsetse is disappointing, but is not a proof that this method would not succeed elsewhere, the unusual prevalence of baboons being a complicating factor. Evidence as to whether tsetse-flies can feed on these animals is extremely contradictory, and if some means could be devised of getting rid of the baboons in the locality, it would constitute a valuable experiment.

At a meeting held at the Administrator's office on 21st August the position regarding tsetse-fly in Southern Rhodesia was discussed. It was stated that farmers from the Wankie District had reported that if the fly spread the district would be ruined for settlement, while the colliery working might be seriously hampered. In the Medical Director's opinion the spread of the fly would tend to increase the spread of sleeping-sickness. The suggestions made by the Government Entomologist for the control of the tsetse-fly [*loc. cit.*] were then discussed. With regard to throwing open a guard area to free shooting, it was remarked that while a general opinion prevailed that the destruction of game would reduce the fly danger, no definite conclusion had ever been reached on this point. It was thought that the best time to undertake destruction of game within a prescribed area would be during the breeding season, as game disturbed at that time usually forsake permanently their old haunts. The suggestions regarding

deforestation of a guard area, deforestation and fencing, destruction of winter haunts such as evergreen trees near water, and the use of poison gas, were all rejected on the grounds of expense.

It was eventually decided to take steps for the destruction of game within a prescribed area in the southern part of the Wankie District. A scheme was subsequently drawn up, defining the tsetse eradication area, within the limits of which antelopes and other mammals should be removed as thoroughly and rapidly as possible by a series of hunts or battues and the cleared area maintained free of such animals as far as possible by patrols for a sufficiently long period to test the effect on the fly. If results within the area treated warrant a continuance of this method, operations would probably be extended to another area. The details of the scheme are outlined and the cost of labour and materials estimated. As an experiment in the destruction of haunts of the tsetse-fly, an isolated patch of bush has been selected. It is proposed, after a preliminary inspection to determine the degree of tsetse infestation of this area, to effect the complete removal of all evergreen or deciduous heavy-foliaged trees by felling, coupled with burning of the grass. Such clearing is to be repeated in subsequent seasons, with periodical inspection by the entomologist to note results.

A recently published report of a committee appointed by the Natal Province records a very great spread of disease in Zululand owing to tsetse-fly. In some localities natives have not been able to keep cattle for several years, and others have sustained heavy losses in their stock. Occupation of the affected areas remains very sparse and the opening up of Crown Lands reserved for purposes of settlement is rendered impossible so long as the several species of game that are known to be carriers are allowed to overrun the lands in question. Whatever arguments may be brought forward with a view to dis-associating trypanosomiasis from game, it is considered that actual demonstration in Zululand has clearly proved that once the reservoir of infection in the shape of certain species of game is removed from a locality, losses from trypanosomiasis cease forthwith. In the opinion of the committee it is imperative in the interests of a closer settlement of Zululand by both Europeans and natives that all game known to act or suspected of acting as carriers of trypanosomiasis should be strictly confined within the limits of their reserve.

BURNETT (J. E.). **Methods of Combating Flies.**—*Qtrly. Bull. Michigan Agric. Coll. Expt. Sta., East Lansing*, i, no. 1, August 1918, pp. 18–19. [Received 12th December 1918.]

The most effective means of poisoning house-flies is to fill soup plates up to the rim with a mixture of 1 part commercial formalin and 19 parts water sweetened with syrup. A good repellent that should be sprayed on cows with a hand-sprayer just before milking time is composed of :—12 oz. crude carbolic acid, 12 oz. turpentine, 12 oz. tar-oil, $\frac{3}{4}$ oz. tannin, made up to 5 U.S. gals. with kerosene oil.

A suitable trap may be made of a barrel from which both ends have been removed. One end is covered with wire netting, and in the other is fixed a funnel made of wire screen, the opening at the point, $\frac{1}{4}$ to $\frac{3}{8}$ inches across, being in the interior of the barrel. This trap is baited with sugar, decayed fruit, etc., and placed on legs 3 inches long.

Tick Eradication.—*Jamaica Dept. Agric. Ann. Rept. for Year ended 31st March 1918, Kingston,* 1918, pp. 24–26. [Received 5th December 1918.]

As the result of Professor Newstead's visit to Jamaica in 1909 to study the tick problem, a very successful liquid for spraying cattle was introduced in which arsenic in the form of Cooper's Dip was added to a solution of paraffin-naphthaline or paranaph. In 1913, 80 per cent. sodium arsenite was adopted as the source of arsenic and has proved to be the cheapest, most convenient and most effective form to use. A new, single-solution dip has been put on the market containing sodium arsenite and certain emulsifying ingredients, but this, though having the practical advantage of greater simplicity in preparation, has only 80 per cent. of the efficiency of the above mixture.

At the beginning of the tick eradication campaign, the only method employed was that of spraying, but in 1913 it was recognised that dipping tanks were necessary for dealing with large herds of cattle, and in 1915 a tank was constructed at a cost of £25, though subsequent modifications and improvements brought its cost up to £60. In 1918 several planters decided to erect tanks, and a commission for the erection of seven has been received from a single proprietor.

The departmental dipping liquid is based on a standard content of 2 lb. of 80 per cent. sodium arsenite per 100 gals., experience having shown this to be the optimum strength for tick-destruction in Jamaica, and the emulsifying effect is obtained by the addition of 3 lb. paranaph per 100 gals. liquid. The pre-war cost of this solution was 1*s.* 2*d.* per 100 gals., or less than one-sixth that of the proprietary dips on the market. During 1917 the whole of the herd on the Government Stock Farm was dipped 16 times, or about every 3 weeks, the average cost of dipping for the year being only two-pence per head. Regular dipping is carried out as a preventive measure, the occurrence of ticks on cattle being rare, though there is always the risk of infestation from neighbours' lands and from horses and mules.

The dipping of horses and mules in a cattle dipping tank is somewhat risky, and though it has been safely done on the stock farm, control of the tick is generally effected in this case by spraying and painting with sheep-wash. At the same time ticks derived from equines do not impart tick-fever and they are therefore not dangerous to cattle.

A remarkable feature of dipping is the way in which long-haired cattle are completely freed from ticks, no previous clipping being necessary, as is the case when spraying is carried out.

For use as a spray the standard wash consists of :—Sodium arsenite 1 oz., paranaph 2 qts. or 5 lb., water 12 qts. An economical commercial wash for use as a spray consists of :—Sodium arsenite 3½ oz., paranaph 1 lb., water 10 gals., tank or rain water being used if procurable. The dip for use in dipping tanks contains sodium arsenite 2 lb., paranaph 3 lb., water 100 gals.

Ritchie (A. H.). **Annual Report of Entomologist.**—*Jamaica Dept. Agric. Ann. Rept. for Year ended 31st March 1918, Kingston,* 1918, pp. 34–40. [Received 8th December 1918.]

In the rice-growing districts the drainage of the land, if carried out extensively, would act as a considerable control of mosquitos

on the plains, where incidence of malaria is high. No attempt has been made by adjustment of weirs on the water channels to maintain continual water interchange, with the result that stagnant water is changed only at long intervals by rain or river overflow. As there is no proper irrigation system or adjustment of soil and water levels, pools are left in the fields which act as mosquito breeding-places.

Satisfactory drainage and water control in districts where rice is being grown, besides ameliorating the malaria and mosquito situation, would also greatly assist in control of liver fluke of cattle and certain Tabanid flies.

VAN GORKOM (W. J.). **Dienst der Pestbestrijding. Verslag over het eerste Kwartaal 1915.** [Anti-Plague Service. Report on the First Quarter of 1915.]—*Meded. Burgerlijken Geneesk. Dienst in Nederlandsch-Indië, Batavia*, v, 1918, pp. 1–71. [Also in English.] [Received 11th December 1918.]

Fumigation of village dwellings as a means of combating plague does not appear to be as effective as at first supposed. Young rats, small lizards and fleas sometimes survive this treatment. In villages where only rat-plague was known cases of human-plague have occurred after fumigation. Furthermore, plague sometimes returns after a brief absence which has followed treatment, and rats escape while preparations are being made. Besides mechanical measures and the use of sulphur dioxide and liquids, experiments have been made with hydrocyanic acid gas, but no definite conclusions were reached as to the value of this agent.

BAUDET (E. A. R. F.). **Het Onderkennen van *Sarcoptes-*, *Psoroptes-* en *Chorioptes*-schurftmijten.** [The Differentiation of *Sarcoptes*, *Psoroptes* and *Chorioptes* Scab-Mites.] — *Tijdschr. Vergelijkende Geneeskunde, Gezondheidsleer, en Parasitaire- en Infectieuse Dierziekten, Leyden*, i, 1915, pp. 22–27, 6 plates. [Received 10th February 1919.]

The object of this paper is to indicate with the aid of micro-photographs some special differences between these genera. These are of practical value in making a correct diagnosis in cases of scabies.

ROOS (J.). **Psoroptesschurft bij Paarden.** [Psoroptic Mange in the Horse.]—*Tijdschr. Vergelijkende Geneeskunde, Gezondheidsleer, en Parasitaire- en Infectieuse Dierziekten, Leyden*, i, 1915, pp. 252–262, 1 plate. [Received 10th February 1919.]

Horse mange due to *Psoroptes*, *Dermatocoptes*, and *Dermatodectes communis* is less common than the sarcoptic and chorioptic forms. It occurs on those parts of the animal where the hair is long enough to protect the mites from being brushed away. In the case described here, however, the places affected were nearly all on both sides of the buttock and on the saddle. English investigators have believed that *Psoroptes* and *Sarcoptes* can sometimes occur together, but in this case the latter was not found. An indispensable part of treatment is close shearing. After removing any scabs and crusts the skin is washed with a tepid soap-soda solution and this is followed by the application of a tobacco decoction. An ointment containing 3 per

cent. of chloret. hydrargyric-ammon. gave excellent results. Without any preliminary measures the ointment is rubbed on and left for 4 days and is then scraped off with a spatula. This procedure is repeated twice and the animals are then washed. Two applications may suffice in some cases.

PARROT (L.). **Répartition Géographique de *Phlebotomus minutus* var. *africanus*, dans le Département de Constantine.**—[Geographical Distribution of *Phlebotomus minutus* var. *africanus* in the Department of Constantine.]—*Bull. Soc. Path. Exot., Paris*, xi, no. 9, 13th November 1918, pp. 791–792.

In view of the hypothesis advanced by MM. Sergent, Lemaire and Senevet concerning the possible rôle of *Phlebotomus*, and particularly of *P. minutus* var. *africanus* in the transmission of Oriental sore [see this *Review*, Ser. B, iii, p. 230], the authors publish the results of their observations upon the geographical distribution of these blood-sucking midges in the Department of Constantine. Captures up to the present time have included the following species :—(1) In the littoral zone, at Bône (Saint-Ferdinand district, 1915) : *P. papatasii*, Scop., 40 per cent. ; *P. perniciosus*, Newst., 10 per cent. ; *P. minutus* var. *africanus*, Newst., 50 per cent. (2) On the high plateaux, at Gambetta (near Souk-Ahras, 1914) : *P. papatasii*, 45 per cent. ; *P. perniciosus*, 30 per cent. ; *P. minutus* var. *africanus*, 25 per cent. ; and at MacMahon (at the northern limit of the so-called Biskra centre of endemic leishmaniasis, 1917–1918) : *P. papatasii*, 10 per cent. ; *P. perniciosus*, 60 per cent. ; *P. sergenti*, Parrot, 20 per cent. ; *P. minutus* var. *africanus*, 10 per cent. (3) In the ante-Saharan steppe, at Barika (1915–1916) : *P. papatasii*, 25 per cent. ; *P. perniciosus* 5 per cent. ; *P. minutus* var. *africanus*, 70 per cent.

It is obvious that the abundance of *P. minutus* var. *africanus* varies greatly from one region to another. It would, however, be rash to conclude that certain localities are more favourable than others to the development of that species ; on the contrary, inspection shows that within the limits of one locality the distribution of the different species of *Phlebotomus* varies considerably in different quarters and in different houses. In other words, the percentages given above have only a relative value, and might be completely modified by extending the investigations to other points of the localities from which they have been drawn. All that can be stated with certainty is that *P. minutus* var. *africanus* is found throughout the Department of Constantine, from the sea to the Sahara.

MESNIL (F.) & ROUBAUD (E.). **Insects and Infections at the Front.**—*C. R. Soc. Biol., Paris*, lxxxi, no. 20, 16th November 1918, pp. 1034–1038.

The importance of insects as carriers of disease, as emphasised by the conditions of trench warfare during the past four years, is summarised in this paper. Those dealt with include biting flies such as *Stomoxys*, *Simulium*, *Ceratopogon*, mosquitos and *Phlebotomus*, house-flies such as *Fannia canicularis*, *F. scalaris*, *Muscina* and *Pollenia*, blow-flies such as *Calliphora*, *Lucilia*, *Phormia*, and *Sarcophaga*, as well as fleas and lice.

VLEMING (E.). **Vergelijkend Onderzoek omtrent Filariase bij den Mensch en bij den Hond in Suriname.** [A Comparative Investigation on Human and Canine Filariasis in Surinam.]—*Tijdschr. Vergelijkende Geneeskunde, Gezondheidsleer, en Parasitaire- en Infectieus: Dierziekten, Leyden*, ii, 1917, pp. 69–116, 1 plate.

VLEMING (E.). **Filariase bij Paarden in Suriname.** [Equine Filariasis in Surinam.]—*Ibidem*, pp. 180–195, 2 plates. [Received 10th February 1919.]

The subject-matter of the first of these papers is indicated by its title. It is considered possible that dogs suffering from filariasis may prove to be dangerous carriers as regards man. The diseases known as Babesidiosis canis surinamensis and Filariasis canis surinamensis are both due to varying developmental stadia derived from *Macrofilaria canis surinamensis*.

In the second paper, equine filariasis, which was unknown to science a few years ago, is described from cases observed in Surinam.

PÉJU (G.) & CORDIER (E.). **Epidémie palustre et Conditions de l'Anophélisme en Argonne.** [An Epidemic of Malaria and Anopheline Conditions in Argonne.]—*C. R. Soc. Biol., Paris*, lxxxi, no. 20, 16th November 1918, pp. 1039–1041.

A slight outbreak of malaria occurred during the summer of 1917 on the borders of Argonne in a district occupied by a camp of infantry and engineers, the neighbourhood consisting of vast forests interspersed with damp meadows intersected by streams. The nearest village, which had been evacuated, was between 2 and 3 miles distant from the area frequented by the troops. Many mosquitos occurred in the district, of which Anophelines constituted 6 to 8 per cent., the larvae of *A. bifurcatus* and *A. maculipennis* being found, not only in stagnant waters, but also in the streams and rivers.

A. bifurcatus was seldom met with in houses, but on the borders of the woods, at twilight, it constituted 2·8 per cent. of the mosquitos in summer. *A. maculipennis*, on the contrary, appeared to be a domestic species, seeking the cool dark corners of houses, stables, etc., during the day, often at a distance of more than 2 miles from its breeding-places, and representing 75 per cent. of the mosquitos present. This same proportion occurred in uninhabited districts, however, such as abandoned foresters' huts, showing that the presence of man is not the attraction. In the evening, this species leaves the houses and seeks the woods, where it attacks man. The Culicine, *Ochlerotatus* (*Theobaldinella*) *nemorosus*, during the day lives in the woods, seeking houses at night. In damp weather the percentage of *A. maculipennis* found in houses is much smaller, being reduced to from 10 to 20 per cent. Another species found, though rarely, was *A. plumbeus*, Hal. (*nigripes*, Staeg.), with habits like those of *A. bifurcatus*.

The cause of the outbreak of this malarial epidemic is uncertain, malaria being unknown in the district before the War and no case having occurred before 1917, in spite of the numerous and varied contingents which occupied the district during the first four years of the War, and the high percentage of Anophelines present during the warm months. In the regiment in which the outbreak occurred there were neither recognised malarial subjects nor recruits from Salonica.

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The origin therefore must be looked for either in Colonial contingents relieved in April, a season however not favourable to Anophelines, or more probably in a Moroccan contingent which occupied the neighbouring sector shortly before the outbreak of the epidemic.

EALAND (C. A.). **British Insects and Disease.**—*Chambers's Jl., Edinburgh*, Part 96, December 1918, pp. 772–775.

A general popular review is here given of the relations between insects and disease, and in particular of British blood-sucking Arthropods and the dangers threatened by them as carriers of diseases that are likely to be brought into this country by troops returning from the seats of war. Some of the statements made are open to correction. The presence or absence of spots upon the wings of mosquitos cannot be accepted as a reliable distinction between the Culicines and malaria-carrying Anophelines, since the former occasionally include spotted-winged forms, while Anophelines with unspotted wings also occur, *e.g.*, *Anopheles bifurcatus*. With regard to the disease known as pellagra, it is stated that "everything points to the fact that the malady is insect-borne, and that buffalo-gnats [SIMULIIDAE] are the germ-carriers." In view of the fact that a large body of evidence has been collected that makes this highly improbable, this statement cannot be accepted with any confidence.

JACK (R. W.). **Tsetse Fly in Southern Rhodesia, 1918.**—*Rhodesia Agric. Jl., Salisbury*, xv, no. 5, October 1918, pp. 406–415, 2 plates.

This is a popular account of the three species of tsetse-flies that occur in Southern Rhodesia, namely, *Glossina morsitans*, *G. pallidipes* and *G. brevipalpis*. The areas of the Southern Rhodesian fly-belts are defined and their topography and the conditions that influence fly-prevalence discussed. The question of the association between tsetse-fly and the larger wild animals is touched upon. The author is convinced that the infection of cattle with trypanosomiasis in the absence of tsetse-fly is of frequent occurrence in Rhodesia, and that the greatest care should be taken not to allow infected cattle to come into contact with healthy herds, especially during the spring and summer months. It is remarked that while the spread of *Glossina* in some parts is creating a serious position locally, reports have in many cases been much exaggerated and there is no danger of any overwhelming calamity due to a wholesale spread of tsetse-fly.

Cattle Cleansing Ordinance, 1918.—*Rhodesia Agric. Jl., Salisbury*, xv, no. 5, October 1918, pp. 489–491.

By the terms of Ordinance No. 9, 1918, promulgated 27th September 1918, and known as the Cattle Cleansing Ordinance, 1918, all owners of cattle, both those included under the Compulsory Dipping Ordinance 1914, and all others except those in certain exempted areas shall be required to clean their cattle according to the regulations of the Ordinance, that is, to maintain them free from tick infestation by submerging them in a dipping tank containing an effective tick-destroying agent. Tick infestation is defined as the presence of ten

or more engorged ticks other than the bont tick (*Amblyomma hebraeum* or *A. variegatum*) or bont-legged tick (*Hyalomma aegyptium*). Any owner not complying with the regulations of this Ordinance will be liable to a heavy penalty. Under this Ordinance the Compulsory Dipping Ordinance, 1914, is repealed.

SERGENT (Ed.) & SERGENT (Et.). **Etudes épidémiologiques et prophylactiques du Paludisme. Quinzième et Seizième Campagnes en Algérie en 1916 et 1917.** [Epidemiological and prophylactic Studies in Malaria. Fifteenth and Sixteenth Campaigns in Algeria in 1916 and 1917.]—*Ann. Inst. Pasteur, Paris,* xxxii, no. 12, December 1918, pp. 573–583, 1 fig.

The two outstanding facts in the history of malaria in Algeria during the years 1916–1917 are the epidemics that broke out in the departments of Algiers and Oran in 1916 and 1917 respectively. These epidemics, by their gravity, have had an important effect on the economic life of the regions attacked; happening at the time of agricultural operations, they have hindered the planters, who were frequently rendered short of labour. The mortality among the natives increased in Algiers in 1916, and in Oran in 1917, fatal cases among Europeans being equally numerous. Both outbreaks were due to abnormal rainfalls in June, that in 1916 transforming a plain in Algiers into a sheet of water more than 2½ square miles in extent, which became the breeding-place of innumerable Anophelines. Accessory causes were the neglected state of the canals, ditches and drains, there being a shortage of labour due to war conditions; storms and wind, which, in the opinion of the inhabitants, brought great flights of the insects in October; the rapid increase in summer of numerous green algae in the breeding-places of Anophelines, especially those of *Anopheles maculipennis.*

A. turkhudi (*Pyretophorus myzomyifacies*), already recorded from the Sahara and the coast, was found in 1916 at an altitude of 3,100 feet. No connection could be traced between the increase of malaria and excavations of the soil during the two years of the epidemic. There seems to be no foundation in fact for the view that the outbreak was due to importation by infected French and Serbian troops from Macedonia, since there was no correlation between the geographical distribution of these and that of the malarial epidemics of 1916–17, which must thus be accounted for by the exceptional meteorological conditions of those years.

HADWEN (S.). **A Further Contribution on the Biology of *Hypoderma lineatum*.**—*Canada Dept. Agric., Ottawa,* Health Animals Branch, Scient. Ser. Bull. no. 21, 11th March 1916, 10 pp., 5 plates. [Received 30th December 1918.]

HADWEN (S.) & BRUCE (E. A.). **Observations on the Migration of Warble Larvae through the Tissues.**—*Canada Dept. Agric., Ottawa,* Health Animals Branch, Scient. Ser. Bull. no. 22, 8th May 1916, 14 pp., 7 figs. [Received 30th December 1918.]

The bulk of the information contained in these bulletins has previously been abstracted [see this *Review,* Ser. B. iv, p. 195 and vi, p. 45].

HOWARD (L. O.). **Report of the Entomologist.**—*U.S. Dept. Agric., Bureau Entom., Washington, D.C.*, 19th September 1918, pp. 11–12.

In the section of this report dealing with insects affecting the health of man and animals it is stated that the study of the body louse [*Pediculus humanus*] was taken up during the year under review and all proposed remedies were investigated in co-operation with the National Research Council and the War Department. The work on insects affecting domestic animals has been continued and insects frequenting packing houses and abattoirs have been under observation, experiments having been made with traps of various kinds.

KITASHIMA (T.) & MIYAJIMA (M.). **Studien über die Tsutsugamushi-Krankheit.** [Studies on the Tsutsugamushi Disease.]—*Kitasato Archives Exptl. Med., Tokyo*, ii, no. 2, 1918, pp. 91–146, 4 plates. [Received 2nd January, 1919.]

Much information is here given regarding tsutsugamushi or river fever in Japan, where it is endemic in the Niigata district, occurring in riparian localities in the summer. It is identical with the Kedani or Shashitu fever in the Akita district, and in 1913 it was observed along the Mogamigawa River in the Yamagata district. A very similar, or identical fever has been recorded in newly cultivated fields in Formosa. In the years 1904-1909, the number of deaths due to it in the Niigata district totalled 368, and 300 of these cases ended fatally within 20 days, so that its acute character is evident. Popular tradition has ascribed the disease to the bite of a mite [*Trombidium akamushi*], but the observations recorded here show that such bites do not always convey infection, since only a few of the mites harbour the virus.

DUNN (L. H.). **Studies on the Iguana Tick, *Amblyomma dissimile*, in Panama.**—*Jl. Parasitology, Urbana, Ill.*, v, no. 1, September 1918, pp. 1–10.

Amblyomma dissimile has been taken on various species of snakes commonly found on the Isthmus of Panama. Infestation reached the proportion of 60 per cent. of examined specimens, this percentage being greatly exceeded among those species with habits compatible with infestation, such as the non-burrowing terrestrial and arboreal forms. Toads and iguanas were also found to be frequently infested, but in no case has the tick been found attached to any warm-blooded animal. The author tried the experiment of confining 20 larvae in an uncovered pill-box and applied it to his arm for over five hours, but none of the larvae became attached to the skin during that time. Although *A. dissimile* has no apparent economic importance, the bionomics and life-history of the species have been studied and the results are given in this paper for comparison with observations on this species in other localities. Tables are given showing the oviposition records of 10 females; the maximum number of eggs deposited by one individual was 9,254, over a period of 35 days, oviposition beginning 6 days after dropping from the host. During rearing experiments, one case was observed in which moulting occurred on the host. This

was exceptional, but explains the difference of opinion that has been expressed regarding this point. Several of the snakes under observation died from the effects of excessive tick infestation.

WHARTON (L. D.). **Notes on Two Species of Nematodes (*Gongylonema ingluvicola*, Ransom, 1904, and *Capillaria strumosa*, Reibisch, 1893), parasitic in the Crop of Chickens.**—*Jl. Parasitology, Urbana, Ill.*, v, no. 1, September 1918, pp. 25–28, 2 figs.

Notes are given on two species of Nematodes found in the walls of the crop of chickens. Both live in winding burrows in the mucosa and are never found free in the lumen. *Gongylonema ingluvicola*, Ransom, is the larger of the two and was found in about 40 per cent., and *Capillaria strumosa*, Reibisch, in about 30 per cent. of the chickens dissected.

LLOYD (Lieut. Ll.). **Lice and their Menace to Man.**—*London*, Henry Frowde and Hodder & Stoughton, 1919, 136 pp., 13 illus., 4 charts. Price 7*s.* 6*d.* net.

A general popular account of lice and their habits is given in this book, which has been compiled for the use of the public rather than for the specialist and sets forth the main facts concerning the lice infesting man that have been discovered during the last few years. With regard to the persistence of infestation among troops on active service, it is pointed out that this is due not to any fault in the method of disinfestation suggested, but to the excessive difficulties of applying them under campaigning conditions. The structure and habits of the various species of lice, their dissemination and methods of disinfestation and the diseases conveyed by them are discussed. The biology, anatomy and control of *Pediculus humanus* occupy the bulk of the work, but separate chapters are devoted to *P. capitis* and *Phthirius pubis* as well as to typhus and relapsing fever, and the book concludes with a chapter on trench fever by Major W. Byam, R.A.M.C.

PIERCE (W. D.). **Mosquito Control.**—*Agric. News, Barbados*, xvii, nos. 433–434, 30th November & 14th December 1918, pp. 374–375 & 388–389.

This article is a résumé of modern knowledge of mosquito control by means of sanitary engineering works, larvicides, oiling and predatory fish. The protection of dwellings by screening and of the individual by repellents is dealt with, formulae for some of the recognised repellents being given [see this *Review*, Ser. B, vi, p. 69].

JONES (H. L.). **Report of the Acting Chief Health Officer for Two Years ending 30th June 1917.**—*Northern Territory Australia Rept. Administrator for Years 1915–16 and 1916–17, Darwin*, 10th January 1918, pp. 36–40. [Received 15th January, 1919.]

Malaria was prevalent in the country districts, epidemics having occurred at four points during the period under review; these soon

abated under proper treatment and preventive measures. It is probably not endemic in the Territory, the outbreak in question being probably due to the influx of infected individuals from New Guinea, Patagonia and North Queensland.

The Culicid, *Taeniorhynchus brevicellulus* (*Chrysoconops acer*), has been bred out from larvae obtained from bathroom drainage on premises in Darwin. There has been an increase in the Dytiscid beetle predaceous on mosquito larvae, the efficacy of which was demonstrated in 1914. Since that time it has been widely distributed and has rapidly multiplied.

Dickinson (C. G.). **Report of the Chief Veterinary Officer.**—*Northern Territory Australia Rept. Administrator for Years 1915–16 and 1916–17, Darwin*, 10th January 1918, pp. 42–43. [Received 15th January 1919.]

Buffalo flies (*Lyperosia exigua*), which are a great pest of horses and cattle during the wet season, can be effectively controlled by the use of Japanese fish-oil, which experimentally renders cattle immune for a period of from 4 to 6 days, though in the bush the protection afforded cannot be relied on for more than 1 to 3 days.

At one station the stock was found to be tick-infested though not with the true cattle tick, *Boophilus*, but as far as could be determined from defective specimens, with a species of *Haemaphysalis* or *Amblyomna*.

Howlett (F. M.). **Report of the Imperial Pathological Entomologist.**—*Scient. Repts. Agric. Research Inst., Pusa, 1917–18*; *Calcutta*, 1918, pp. 117–120. [Received 21st January 1919.]

Attention was chiefly directed during the year to the comparative study of the habits of Tabanid larvae, and to working out the life-histories of certain midges at Pusa belonging to the genera *Culicoides* and *Ceratopogon*, a group of which very little is known; investigations are being continued in view of the possibility that these flies may convey disease.

Investigations on the trap-breeding of *Stegomyia*, *i.e.*, the supply of artificial breeding-places, have been continued, and a number of organic compounds have been tested as larvicides, without any practical results except in the case of xanthates, which have a very high toxicity for mosquito larvae. Experiments to ascertain the factors which influence mosquitos, especially *Stegomyia albopicta* (*scutellaris*), in their choice of breeding-places have shown that temperature has a definite influence, eggs being laid more freely in warm water; various chemical compounds have a deterrent effect when dissolved in small quantities ($\frac{1}{2}$ to 1 per cent.) in the water; a few substances, especially sodium citrate and tartrate, have an attractive effect, a far larger number of eggs being laid in dilute solutions of these substances than in pure water. Work is being carried on with the object of discovering a repellent, limited as regards cost, which shall effectively prevent Tabanids from attacking camels, and so help to check the spread of surra among transport and other animals.

DE MEZA (J.). **Report of the Acting Senior Veterinary Officer.**—*Nyasaland Protectorate Ann. Rept. Dept. Agric. for Year ended 31st March 1918, Zomba*, 31st October 1918, pp. 18–19. [Received 24th January 1919.]

Demodectic mange has now practically disappeared from the Zomba district, only three cases having been discovered, all of which were immediately slaughtered.

Boophilus decoloratus, the tick carrying piroplasmosis, has now almost disappeared from the same district, though it appeared in another where several animals died before advice and remedies could be obtained.

One outbreak of trypanosomiasis is reported from an area where *Glossina brevipalpis* occurs, and where, for this reason, cases must be expected to occur from time to time.

DORÉ (A. B.). **Rat Trypanosomes in New Zealand.**—*N.Z. Jl. Science & Technology, Wellington*, i, no. 4, July 1918, p. 200. [Received 31st January 1919.]

Trypanosoma lewisi has been recorded in rats from most parts of the world, but not hitherto from New Zealand. It is transmitted from one rat to another by fleas and lice. The blood-examination of several hundred rats caught in various parts of the North Island has shown the presence of trypanosomes the measurements of which correspond with those obtained elsewhere for *T. lewisi*. Of rats caught in the neighbourhood of sewers, 30 per cent. were found infected, as against 12 per cent. of those captured on wharves and in grain-stores. In view of the fact that the native rats introduced by the Maoris are rapidly disappearing, it seems possible that this trypanosome may be the primary cause, as they may not have the immunity which the European species probably possess.

METZ (C. W.). *Anopheles crucians*. **Habits of Larvae and Adults.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiii, no. 49, 6th December 1918, pp. 2156–2169.

During malaria investigations in Alabama in the summer of 1918, a study was undertaken of *Anopheles crucians*, which is less known than either of the other species common to the gulf coast region of the United States, namely, *A. punctipennis* and *A. quadrimaculatus*. The breeding ground was a shallow swamp about three miles long that occupied a natural watercourse which during the rainy season had a sluggish flow but later dried up into a series of shallow, isolated puddles. A wide range of conditions existed in this swamp, part of it being heavily wooded and part open and grassy. A small ditch flowed into one end of the swamp, carrying refuse from a chemical factory in which sulphuric acid was manufactured, the waters of this ditch being heavily impregnated with chemicals. During mid-April, when the swamp was first observed, the mean temperature was from 40° to 59° F., the maximum being 67° and the minimum 35°. At that time the waters of the swamp were literally covered with Anopheline larvae, many of them nearly full-grown. These were distributed without apparent discrimination throughout the

swamp and were all found to be those of *A. crucians*. This species was not found in any other spot for several miles round, though with warmer weather both *A. punctipennis* and *A. quadrimaculatus* were found throughout the territory examined up to within a few feet of the swamp. It was therefore evident that these waters possessed some peculiarity favourable to *A. crucians* but repellent to the other two species. The chemical wastes emptying into the upper end of the swamp were at once suspected, and the results of subsequent investigations leave little doubt that they were the determining factor. An analysis of this water showed it to be acid and to have a high content of sulphates, sodium, potassium, iron and aluminium. Fish were entirely absent, and experiments showed the water to be poisonous to them. Since *A. crucians* was propagating in enormous numbers it is evident that the food-supply was suitable and at least sufficiently abundant. The water contained a scanty microscopic fauna and flora, but a large quantity of minute particles of organic material that was apparently disintegrated plant-tissue was present. This was presumably derived from the mass of dead leaves covering the bottom of the swamp, its abundance probably being due to chemical action caused by the substances emptied into the water from the factory. It would appear from these deductions that *A. crucians* can subsist in nature on a diet made up primarily of non-living vegetable matter, and this has been proved in the laboratory. It is not known whether the chemical properties of the swamp waters possess an attraction for the egg-laying females and the abundance of *A. crucians* is due to this factor, or whether the females lay their eggs indiscriminately and their development in the contaminated water is due to the latter being especially suited to this species. Experiments showed that larvae of *A. punctipennis* were able to live side by side with *A. crucians* in the swamp water, while *A. crucians* could also develop in water outside the swamp, development being in that case considerably retarded; only one adult was obtained from about 20 larvae placed outside the swamp, and many larvae failed to pupate. It is considered probable that the determining factor in development in nature is either the selection of favourable places for egg-laying or else a direct effect of the water on the eggs, unfavourable conditions destroying them before they hatch. More investigation on this point is desirable. *A. crucians*, which is generally known to breed mainly in the autumn and winter, was observed breeding prolifically in the swamp early in April and continued to do so until late August, when the observations were discontinued.

Experiments were made to determine the range of flight of *A. crucians* from the swamp towards the neighbouring city of Montgomery. The data obtained are given in a chart and tables. It was found that *A. crucians*, when breeding in large numbers, becomes distributed over an area within approximately 7,000 feet of the breeding-place in numbers sufficient to be of sanitary importance. This is in agreement with the conclusions previously reached by Le Prince. From 7,000 to 9,000 feet, the danger would be questionable, probably depending upon circumstances, while 9,000 feet seems to be the limit of the range of flight. This species showed very little tendency to choose dwelling houses for shelter in the daytime. The bulk of the

specimens were found under houses, in stables, pig-pens, etc., damp sites being preferred. The observations of various authors, as well as those described in the present paper, all indicate that *A. crucians* is attracted by water containing an excess of mineral salts, while there is some reason to believe that a concentration of organic products is equally effective. The relation of *A. crucians* to contaminated water brings up another question that may have some important bearing upon practical malaria control. Nitre cake is at present used as a mosquito larvicide. This material, which is a by-product of the manufacture of sulphuric acid, was one of the principal elements producing the contamination of the swamp described in the present paper. It is possible, therefore, that the use of nitre cake as a larvicide, far from being efficacious in that respect, may encourage the breeding of *A. crucians* as soon as the concentration becomes low enough.

The importance of *A. crucians* as a malaria carrier is being further studied; apparently it is less important than *A. quadrimaculatus*, but perhaps more so than *A. punctipennis*.

Koch (A.). **Studien an Larven von *Culex pipiens* bei der Submersion.** [Studies on submerged Larvae of *C. pipiens*.]—*Zoologischer Anzeiger, Leipzic*, l, no. 3–4, 6th December 1918, pp. 105–111.

The physico-chemical mechanism of tracheal respiration in Culicid larvae is not yet clear, and experiments were made with larvae of *C. pipiens* to test the chief theories relating to the exchange of gases in this process. The theories advanced by Palmén, Hertwig and others, Deegener (1913) and Frankenberg (1915) are briefly summarised. The observations recorded here seem to confirm Deegener's respiration theory, viz., that the end-branches of the tracheae supply oxygen to the organs, while the carbonic acid is taken from the blood and conveyed to the larger peripheral tracheae or to the intestinal wall and thus eliminated from the body. It is however necessary to bear in mind the possibility mentioned by Deegener that the carbonic acid from the blood may be passed back again through the tracheae to the siphon. The larvae were confined in tubes so arranged as to prevent access to the surface of the water or to atmospheric air. It was found that 85·5 per cent. of the 131 larvae examined were heavier than water and therefore sank. Gravity compensation depends on the size of the larva, the degree to which the intestine is filled with food, and the condition of the tracheae. The speed of passive sinking is directly proportional to the size of the larva and to the quantity of food and inversely proportional to the volume of air in the tracheae. The tracheal system therefore plays a hydrostatic rôle, but the volume of air contained in it depends solely on the processes of respiration. When no natatory movements are made the larva sinks, assuming a vertical position (*Culex* position). Prolonged submersion empties the tracheae and leads to a gradual change to a horizontal position (*Anopheles* position). The position of *Culex* larvae is therefore a passive equilibrium due to the distribution of air and tissue within the body. The larva seeks to re-act against the passive sinking by active swimming towards the surface in quest of air. These active movements gradually decrease when submersion is prolonged and they finally cease. In a series of 22 experiments it was found that in

water containing much carbon dioxide the larvae died from carbon dioxide poisoning and not for lack of oxygen, whereas in water containing a normal or a slight amount of carbon dioxide they died of paralysis due to lack of oxygen. *Culex* larvae can only draw a relatively small quantity of oxygen from the water for use in producing energy. Some other experiments led to the surprising result that instead of gradually emptying during submersion the tracheae fill still more and that when they are quite full small gas bubbles escape from the siphon, which is therefore not always completely closed under water. This gas cannot be oxygen, for asphyxiation could not be possible in the presence of an excess of oxygen. It is possible that the blood provides for the reception and carriage of carbonic acid penetrating from without or produced by changes of the cell-tissues, or that air "that has already been breathed" is stored up in the tracheae. Intestinal respiration does not appear to be involved, but the removal of the branchial leaflets causes a reduction in the capacity to absorb oxygen. The chief function of the branchial leaflets is probably the absorption of oxygen, while (subject to the restrictions mentioned) the elimination of carbonic acid from the blood occurs through the body-walls.

Grant (J. T.) & Bacot (A.). **Experiments concerning the Efficiency of Hot-air Huts for the Disinfestation of Blankets and Clothing.**—*Jl. R.A.M.C., London*, xxxi, no. 6, December 1918, pp. 443–461, 4 plans.

The effects of the exposure of lice and their eggs in hot-air huts, in which the source of heat is coke braziers, fall into two categories, (1) that in which the effects are optically visible with a magnification of about 10 diameters; (2) that in which there are no immediate visible signs of the cause of death of active lice, and incubation of the eggs is necessary in order to test if they are killed or not.

The line of demarcation corresponds roughly with 30 minutes' exposure to a temperature below or above 140° F. If above this, the eggs are collapsed or shrivelled and the bodies of the lice are dried up, discoloured or brittle according to the extent of the rise above 140° F. If below, the lice are soft, and little, if at all, discoloured, while the appearance of the eggs would be unchanged. An outstanding feature of the effect of heat on the eggs is the very narrow range of its variable action, there being only one instance recorded of partial action, when a temperature of 125° F. killed all but 2 or 3 eggs out of more than 50 exposed. The experiments, which are described in detail, showed that a temperature of 132° F. is amply sufficient to destroy both lice and their eggs, with a minimum of 15 minutes' treatment, even when protected by more than one thickness of khaki cloth; in this case the door thermometer registered 140° F. throughout the tests. This allows a good margin for faulty construction, but a thoroughly well constructed and efficiently worked hot-chamber ought to be able to run safely at 132° F. Mixed wet and dry garments should not be treated at the same time, as some of the eggs in wet garments might escape destruction, and the moisture would tend to reduce the temperature in the dry ones. Equalisation of the temperature throughout the hut is of great importance, and it is

suggested that an electric fan would probably give the best result in this respect. Blankets and clothing should not be folded or pressed closely together during treatment, and should not be allowed to come within a foot of the floor, for both lice and their eggs were able to survive during the above experiments both on and within a few inches of the concrete floor. The garments after treatment should therefore never be thrown on the floors, even though these have been regularly washed, as they should be, with a 2 per cent. solution of cresol soap emulsion or lysol, or sprinkled with powdered naphthaline before each day's work.

Suggestions accompanied by plans are given for an improved pattern of hot-air hut.

LEBOEUF (A.) & GAMBIER (A.). **La Spirochétose humaine et l'** ***Ornithodorus moubata*** **dans la Colonie du Moyen-Congo.** [Human Spirochaetosis and *Ornithodorus moubata* in the Middle Congo Colony.]—*Bull. Soc. Path. Exot., Paris*, xi, no, 10, 11th December, 1918. pp. 833–836.

In consequence of the discovery of two cases of human spirochaetosis at Brazzaville, in the Middle-Congo [see this *Review*, Ser. B, vi, p. 158], further observations have been conducted in this region, with the result that *Ornithodorus moubata* has been found to occur in practically all the villages of the region and particularly in all the settlements along the route from Brazzaville to Pangala. All the huts in a given settlement were not found to be infested, but chiefly those that are badly kept and dirty, especially the rest-houses where travellers stop for the night. According to reports from various quarters, the tick must be well distributed throughout the south of the Middle Congo, and this is confirmed by the occurrence of spirochaetosis in natives arriving from distant and widely separated villages. While in the villages visited spirochaetosis has never been observed except where *O. moubata* occurs, the tick is undoubtedly present in villages where no case of spirochaetosis has been detected by examination of the inhabitants. The authors are convinced, however, that wherever the tick occurs there are bound to be cases of spirochaetosis occurring with more or less frequency and dependent probably on seasonal or other conditions.

Experiments to determine the resistance of *O. moubata* have shown that the tick can live without nourishment for as long as four months. Solutions of iron and copper sulphate seemed to have no effect upon ticks in a closed vessel, but a solution of carbolic acid (30 per cent.) was found to kill all the individuals placed in a vessel containing it. This substance might therefore be employed for their destruction, but its use would be very limited. The best remedial measure, apart from general cleanliness, seems to be thorough and repeated turning over of the earthen floors of the huts after thoroughly sprinkling them. The inhabitants should sleep on couches raised at least 20 inches from the ground. Above all, if light were let into the huts, the ticks would avoid them, but it is scarcely to be hoped that the natives of this part of Africa could be persuaded to effect such an innovation.

Van Zwaluwenburg (R. H.). **Report of the Entomologist.**—*Rept. Porto Rico Agric. Expt. Sta., 1917, Washington, D.C.*, 20th September 1918, pp. 31–32. [Received 17th January 1919.]

The life-history study of the Australian cattle tick [*Boophilus australis*] has been continued. It is recognised that the quickest and most certain way of exterminating the tick is by thorough and consistent dipping. Starvation by pasture rotation is a useful supplementary measure, but is not practicable in the case of working oxen subject to re-infestation along the road they travel, nor in cases where only limited pasturage is available. All cattle on the Station estate are dipped regularly every two weeks in a bath containing 0·19 per cent. arsenious oxide, the standard low strength solution. As the minimum time for development of the ticks on the host is 20 days in October, dipping every two weeks allows for any lessening of this minimum during warmer seasons of the year. A 0·16 solution of the dip was found ineffective against adult females. Tables are given comparing the duration of the preoviposition and egg-laying periods of the females and incubation of the eggs under artificial and natural conditions.

Carpano (M.). **On a Mite of the Genus *Tyroglyphus*, an accidental Parasite of the Horse.**—*Clinica Veterinaria, Milan*, xli, no. 7, 15th April 1918, pp. 173–177, 1 fig. (Abstract in *Mthly. Bull. Agric. Intell. & Pl. Dis., Rome*, ix, no. 10, October 1918, pp. 1206–1207).

Among accidental parasites removed in the crust and hairs of animals suspected of suffering from mange, occur Sarcoptid mites belonging to the sub-family Tyroglyphinae, which may be mistaken for the true parasitic mites of the horse, and which may possibly, under determined conditions, exercise a certain pathogenic action on the horse. Some of these live normally on decomposing animal and vegetable matter, while others are parasitic on the larvae of grain-eating insects that infest all kinds of cereals and other food-stuffs. These mites may attack man, causing skin irritation sometimes accompanied by fever, such as "vanillism" of workers handling vanilla, water itch of Indian tea-planters, grocers' itch, harvest fever, etc., but no such pathogenic action on the skin of animals has as yet been recorded. Dermatosis on the lips, and spreading to the nose and cheeks of the horse, and produced by mites of the genus *Tyroglyphus* probably in the fodder has, however, been observed.

ENTOMOLOGICAL NOTICES.

Mr. G. F. Hill has been appointed Entomologist at the Australian Institute of Tropical Medicine, Townsville, North Queensland.

NICLOT (—). **Anophélisme et Paludisme en Haute-Alsace (1915-1918).** [Anophelism and Malaria in the Department of Upper Alsace (1915–1918).].—*Bull. Soc. Path. Exot., Paris*, xi, no. 10, 11th December 1918, pp. 848–853.

The physical features of Alsace render it particularly favourable to Anopheline infestation. After the abrupt descent from the Vosges, the plain stretches away to the Rhine, dotted throughout with marshes and pools. The spring is generally characterised by much rain; the summer is sometimes hot, but interrupted by sudden thermometric depressions, particularly after the rains. The endemicity of malaria has long been established in the region, but quinine treatment, sanitary improvements following upon the opening up of factories, and the drainage of some districts, have resulted in a distinct amelioration in the incidence of malaria. In consequence of the War, new reservoirs of the disease have been introduced; men of the Balkan army, having contracted malaria in Serbia or Macedonia, have been repatriated, while successive corps of natives of African or far Eastern origin have been stationed there, all more or less abundantly infested with the malaria organism. Allied contingents have also furnished their quota of infestations. The whole region is heavily infested with Anophelines, the principal species being *Anopheles maculipennis* (*claviger*). The larval infestation, in fact, appears as high as in Macedonia or Algeria, although collections of adults show a relatively low density. Adults captured and dissected showed no malarial infection, either in the salivary glands or the digestive tract; this must, however, occur, though probably within a limited season and space, since primary malaria is undoubtedly present. *A. bifurcatus* has been found in company with *A. maculipennis*, but is far more restricted in its habitat. *Phlebotomus* spp. are commonly found about houses.

This enquiry is as yet only in its preliminary stage and prophylaxis has been reduced to dealing with malaria cases. Anti-larval measures have been undertaken by the various sanitary units, etc. The Allied occupation as far as the Rhine will extend the field of these observations, but it is believed that the valley of the Largue is the limit of the swampy ground. If no further impetus is given to the spread of the disease it is considered that prospects are favourable for a return to better conditions.

SIMPSON (W. J. R.). **The Sanitary Aspects of Warfare in South-Eastern Europe.**—*Trans. Soc. Trop. Med. Hyg., London*, xii, no. 1, 18th October 1918, pp. 1–10, 2 plates. [Received 16th January 1919.]

A general review is given of the sanitary problems of the present War in South-Eastern Europe and the way in which they were met. In the East, and in Macedonia in particular, conditions were exceedingly unfavourable, while the abundance of insect carriers of disease rendered the sanitary organisation for the troops a very difficult matter. The author advances some suggestions for re-organisation of the sanitary services of the army for unhealthy countries and tropical regions, and advocates the establishment of a separate systematic organisation,

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equipment and labour for the insect-borne diseases. An improved type of anti-mosquito and fly protective headgear [see this *Review*, Ser. B, v, p. 138] is described and illustrated from photographs.

FORBES (J. G.). **Filarial Infection in Macedonia. Report of Two Cases of *Filaria conjunctivae* (Addario) in Man, with the First Recorded Discovery of the Male Worm.**—*Trans. Soc. Trop. Med. Hyg., London*, xii, no. 1, 18th October, 1918, pp. 11–16. [Received 16th January 1919.]

Two cases of infection of man by *Filaria conjunctivae*, which is an extremely rare occurrence, are described. Only six previous cases of human infection have been recorded, in each of which only the female worm, generally immature, was found. In the first of the two cases described the infection was at first regarded as due to *Onchocerca volvulus*, but was later found to be caused by the hitherto unrecorded male of *Filaria conjunctivae*, which was obtained from the arm and not from the neighbourhood of the eye, as is usually the case. So far as at present known, its geographical distribution is confined to South-Eastern Europe. Both the cases described occurred in the neighbourhood of horse and mule lines, but the animals were not regarded as possible hosts and were not examined. A brief review of other forms of filarial infection and their insect carriers is given.

SMITH (Maj.-Gen. Sir F.). **The Work of the British Army Veterinary Corps at the Fronts. Part I.**—*Vet. Jl., London*, lxxv, no. 1, January 1919, pp. 8–16.

The history of veterinary science is briefly reviewed in this paper and the importance of veterinary hygiene and preventive medicine, which is generally overlooked by the public, is emphasised. It was the appalling losses due to contagious diseases among troop horses that created the veterinary service, and within a few years of its formation matters improved beyond recognition. It is pointed out that the fight against disease has to be based upon precise scientific knowledge, and that it was the patient study of certain species of blood-sucking flies and ticks that revealed the true nature and origin of diseases that still remain incurable and are capable of destroying the whole human and animal life of a sub-Continent. In war, the chief losses among animals, as among men, are due not to battle casualties but to disease and injury. The organisation of the veterinary service and the methods of dealing with sick animals in war are outlined.

ALLEN (J. A.). **A Preliminary Note on Infectious Keratitis.**—*Jl. Amer. Vet. Med. Assoc., Ithaca, N.Y.*, liv, N.S., vii, no. 4, January 1919, pp. 307–313, 1 fig.

In the course of this paper it is mentioned that the disease is usually conveyed by direct contact or indirectly through the agency of flies. It has been observed to be more prevalent during the fly season, and it is a well-known fact that ophthalmia among natives in Egypt is largely transmitted by flies.

Railliet (A.). **Sur la Nomenclature de deux Œstridés du Cheval.** [A Note on the Nomenclature of Two Equine Œstrids.]—*Bull. Soc. Zool. France, Paris*, xliii, nos. 5–7, 25th August 1918, pp. 102–104.

In the opinion of the author, the name *Gastrophilus veterinus* Clark (1797), should be used for the species of *Gastrophilus* infesting the duodenum of the horse in place of *G. nasalis*, since investigation of the works of Linnaeus clearly shows that the fly to which he gave the specific name *nasalis* is that which is known at the present time as *Cephenomyia trompe*, which is exclusively a parasite of the reindeer.

The substitution by Petrovskaia (1910) of the name *nasalis* for *Rhinoestrus purpureus*, which has been followed by some authors, is inadmissible.

Hadwen (S.) & Cameron (A. E.). **A Contribution to the Knowledge of the Bot-flies, *Gastrophilus intestinalis*, DeG., *G. haemorrhoidalis*, L., & *G. nasalis*, L.**—*Bull. Entom. Research, London*, ix, no. 2, September 1918, pp. 91–106, 2 plates, 10 figs.

An account is given of investigations into the life-histories and habits of the species of *Gastrophilus* occurring in the Western Provinces of Canada. The eggs of all three species are described; that of *G. intestinalis* is generally laid at the distal end of a hair on the shoulders, mane, forelegs, knee or fetlock; that of *G. nasalis* is usually deposited at the proximal end of a hair in the intermaxillary space between the rami of the mandibles beneath the head. The authors' experience does not bear out Theobald's impression that these eggs are laid in the nasal orifices. The egg of *G. haemorrhoidalis* differs from the others in being stalked and generally occurs on the hairs of the lips of the horse, preferably on the lower lip. Previous records of these eggs having been thrust by the fly into the skin of the nose and lips of horses are not confirmed by the present investigations, and are considered to have been erroneous. Experimental hatching of the eggs of the three species shows that the eggs of *G. intestinalis* do not readily hatch unaided, but apparently require the application of moisture and friction or shock, such as would occur when the animal licked them; hatching was produced experimentally by moistening the eggs and passing the blunt edge of a scalpel over them. A large number of eggs of *G. nasalis* hatched spontaneously and a few of those of *G. haemorrhoidalis*. This is regarded as supporting the theory that the newly emerged larvae of these two species may penetrate directly into the integument of the host. Lesions on the skin of the intermaxillary space and lips of the host observed at the time the eggs were hatching may be due to direct penetration of the larvae of *G. nasalis* and *G. haemorrhoidalis* respectively. Newly emerged larvae of *G. intestinalis* failed to penetrate the hair-bearing integument of the host, but positive results were obtained when they were placed on portions of the buccal mucosa of a horse and calf recently killed. A larger number succeeded in penetrating the papillated portion of the calf's tongue as compared with the unpapillated.

All three species are probably present in each of the Western provinces of Canada. In the neighbourhood of Saskatoon, *G. nasalis* is on the wing from mid-July until mid-August, and eggs collected

in early August were found to have already hatched. The appearance of *G. haemorrhoidalis* is probably contemporaneous with that of *G. nasalis*. *G. intestinalis* appears somewhat later and continues active far into the autumn. Of the three species, *G. intestinalis* causes less apprehension to the animal than the other two. Farmers in western Canada frequently shield the lips of their horses from *G. haemorrhoidalis* by means of a wire-screen muzzle of close mesh. As an improvement upon this, an apparatus has been devised consisting of a leather band cut into a series of narrow strips long enough to cover the lips of the horse. The band is buckled under the chin and could also be attached to the head-stall. As a further protection to the nose when the animal raises its head an extra leather flap should be attached to the band directly over the nose and also cut into strips on the lower margin. As a preventive against *G. nasalis*, a piece of canvas extending from the nose-band to the throat is attached under the jaws, and can be fastened to the ring of the head-stall on each side by a cord.

Lodge (O. C.). **An Examination of the Sense-Reactions of Flies.**—*Bull. Entom. Research, London*, ix, no. 2, September 1918, pp. 141–151, 4 plates.

Experiments with various flies, and particularly those concerned in the transmission of intestinal diseases, have been carried out with a view to determining their likes and dislikes and their response to stimuli affecting the senses of smell, sight, touch, taste and the perception of the differences of temperature and humidity. The species tested included *Musca domestica* (house-fly), *Fannia canicularis* (lesser-house-fly), *F. scalaris* (latrine fly), *Calliphora erythrocephala* (blue-bottle), *C. vomitoria* (blue-bottle), *Lucilia caesar* (green-bottle) and *Phormia azurea* (*groenlandica*). A table shows that the percentages of the sexes coming to various baits is approximately equal. The results of offering various baits to different species of flies are also given in tabulated form. A general similarity of taste was observed between the different species with regard to various chemicals and foods; the tastes of *M. domestica* and *P. azurea* were found to approximate most nearly. The experiments demonstrated extreme curiosity on the part of house-flies and also showed the difficulty of finding any substances that will either attract or repel all those that come near them. Mineral and tar oils seem to be among the most repellent substances, and no flies came near the baits to which a few drops of these oils had been added. This distastefulness frequently disappeared, however, after the preparation had been left exposed for a number of hours. The oils of cloves, geraniol, cummin, sassafras and cinnamon bark were found to be the most repellent to house-flies.

As regards poisons, good results were obtained with sodium iodate; when small quantities were mixed with the baits the flies feeding upon these died very quickly, in some cases 99 per cent. were dead in 21 hours. The results from this poison are given in a table and are contrasted with those obtained from formaldehyde solutions, the former accounting for many more deaths than the latter. Sodium iodate has the disadvantage of being very expensive, but further experiments are desirable before definite conclusions can be reached regarding the importance of the iodates of sodium and other metals

as poisons for general use. House-flies showed no colour preference either in the case of foods, coloured lights or coloured fabrics. The optimum temperature of food for house-flies was found to be between 38° and 48° C. (99°–118° F.), the maximum between 55° and 58° C. (132° and 136° F.), and the minimum between 10°–13° C. (50° and 55° F.).

As regards humidity, it was not possible to draw very definite conclusions, but the general impression was that most foods, especially when very moist, were more attractive to house-flies on dry than on wet days. Flies, and particularly blow-flies, were able to stand a greater amount of moist than of dry heat. Blow-flies bred in a greenhouse throve if the air was kept moist, but died if it became dry. This also applies to the maggots, but was more marked in the case of adults. Without water, house-flies were able to live only one or two days. Food covered with glass was less attractive than the same food covered with muslin. Painting over the eyes of flies indicated that they were still able to tell attractive from repellent foods, and are evidently guided more by the sense of smell than by that of sight.

Eggs of *Fannia* were kept under observation in order to determine the duration of the early stages. From eggs laid on a banana skin on 13th August, maggots hatched on 14th to 17th August. They began to pupate on 25th and 26th August and had all pupated by 4th September. Adults began to emerge on 7th September, the maximum emergence being on 23rd and 24th September, and all had emerged by 3rd October.

WATERSTON (J.). **Notes on some Blood-sucking and other Arthropods (except Culicidae) collected in Macedonia in 1917.**—*Bull. Entom. Research, London,* ix, no. 2, September 1918, pp. 153–155.

A list is given of parasitic or noxious Arthropods, particularly of those affecting man, observed by the author in the course of mosquito control work in Macedonia, with notes respecting the locality where found and the host attacked.

Musca domestica was particularly troublesome in one area during late October and early November. Owing probably to heat the flies came readily to baits of sweetened formalin and water and many were killed in this way, while burning, swatting, trapping and spraying disposed of many more. For spraying an aqueous solution of 5 per cent. formalin had been used. As a substitute a mixture was made of ¼ lb. bar-soap boiled till dissolved in ½ gal. water and then ½ gal. paraffin slowly added and ½ pint mixed ketones incorporated in the same way. This was effective but the ketones smelled strongly and discoloured wood-surfaces. The ketones were then omitted and 1 gal. paraffin used in the mixture. This killed the flies almost instantaneously and none that were touched escaped. Even diluted to half strength this mixture was effective. It is considered that it may be worth while to investigate the constitution of a suitable emulsion spray for flies and particularly to ascertain what should be the minimum oil content of such a mixture.

Cameron (A. E.). **The Oviposition Habits of *Gastrophilus nasalis*, L.**—*Science, Lancaster, Pa.*, xlix, no. 1253, 3rd January 1919, p. 26.

In commenting on a paper by Dr. Townsend on the oviposition of *Gastrophilus nasalis*, L. [see this *Review*, Ser. B, vi, p. 189], the author points out that the eggs of *G. nasalis* and *G. intestinalis* are absolutely distinct both as regards shape and method of attachment to the hairs, the former being certainly not adapted for the penetration of the skin of the host. Oviposition on the hairs of the throat is almost invariable, as many as 68 eggs having occasionally been found on a single hair, and the author has never seen the adult fly strike at the lips, and certainly never to oviposit there. He further adds that the view that the egg is retained in the skin after insertion by means of its transverse striations is purely fictitious.

Seurat (L. G.). **Contribution à l'Etude de la Faune Parasitaire de la Tunisie. Nematodes.** [Contribution to the Study of the Parasite Fauna of Tunis. Nematodes.]—*Arch. Inst. Pasteur, Tunis*, x, no. 4, December 1918, pp. 243–275.

This paper deals at length with the parasitic Nematodes of Tunis. Among those mentioned are *Dirofilaria immitis*, occurring in the blood of the dog, and *Filaria bancrofti*, *Anopheles algeriensis*, Theo., being the intermediate host in both cases.

Chatton (E.) & Blanc (G.). **Prédilection du *Rhipicephalus sanguineus* pour le Gondi. Son Rôle probable de Vecteur de la Toxoplasmose.** [Predilection of *Rhipicephalus sanguineus* for the Gundi. Its probable Rôle as Vector of Toxoplasmosis.]—*Arch. Inst. Pasteur, Tunis*, x, no. 4, December 1918, pp. 281–282.

In a previous memoir [see this *Review*, Ser. B, vi, p. 27] the reasons are indicated that lead to the conclusion that *Rhipicephalus sanguineus* is the invertebrate host of the *Toxoplasma* of the gundi [*Ctenodactylus gundi*], and perhaps of the greater part of those occurring in mammals. These can now be stated as :—(1) The ecological ubiquity of the tick among its hosts, of which three species are spontaneously infested by toxoplasmosis, viz. :—the dog, rabbit, gundi, and probably also the ox; (2) the migration of the tick from one host to another between its various moults; (3) the frequent occurrence of larvae and especially of nymphs of the tick on gundi captured in the open. In captivity gundi rapidly lose the ectoparasites which they bear in a state of nature, and there is good reason for thinking that the toxoplasmosis developed by them at the Pasteur Institute of Tunis was not brought by them from their place of origin, but was contracted from other animals in the Institute, by means of the tick. Dogs in particular perhaps acted as a source of virus, a kennel proving to be heavily infested with *R. sanguineus* in all stages of development.

In the course of breeding experiments with eggs laid by females taken from the dog, failing young and hairless mice, the larvae were placed on adult mice that had been shaved. Under these conditions very few of the larvae attached themselves, and of those which did so, many failed to engorge fully. When, however, gundi without any previous preparation were substituted for the the mice, larvae readily attached themselves and practically all became fully engorged.

Péju (G.) & Cordier (E.). **Paludisme et Topographie anophélienne en Argonne à propos d'une Epidémie de Paludisme autochtone.** [Malaria and Anopheline Topography in Argonne in relation to an Epidemic of Indigenous Malaria.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 1, 8th January 1919, pp. 23–34.

The outbreak of malaria occurring in Argonne in 1917 has recently been described [see this *Review*, Ser. B, vii, p. 41]. Its chief peculiarity lies in the fact of its extension and of its being the first epidemic in this region after 4 years sojourn therein of colonial troops, vectors of malaria having been numerous in the region throughout their occupation.

Anophelines constitute, during June to August, from 6 to 8 per cent. of the mosquitos in Argonne. The two indigenous species, *Anopheles bifurcatus* and *A. maculipennis*, occur almost in equal numbers in the evening at the edge of woods, where they bite frequently. During the daytime, while *A. bifurcatus* only appears occasionally about habitations, remaining almost exclusively in the woods and only constituting a danger to those who enter them, *A. maculipennis* is common in houses. *A. plumbeus* (*nigripes*) is also found in Argonne, though rarely, as in other parts of France.

In view of the presence of numbers of men who had become exposed to attacks of malaria while on the various battle-fronts, and of the density and ubiquity of the Anophelines, the outbreak of malarial attacks is less surprising than their relative rarity. Perhaps the reason for this may be found in the check exercised on the parasite by the inclemency and uncertainty of the climate in Argonne. Against the local mosquitos, control measures would probably prove impracticable and unsatisfactory.

Rousseau (L.). **Filariose au Cameroun.** [Filariasis in Kamerun.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 1, 8th January 1919, pp. 35–51.

Observations are recorded from the laboratory of the hospital at Duala in 1917 and 1918. Microfilariasis is general among the adult population of Duala and the forest region of the interior. *Microfilaria loa* and *Filaria loa* are very frequently found and the author's observations have convinced him that the former is the embryonic form of the latter. *Microfilaria perstans*, the characteristics of which are described, occurs in numerous cases and is often associated with *M. loa*; the adult form has not been traced. The connection of these two parasites with the cases of elephantiasis so frequent in the vicinity of Duala is discussed. The adult form, *F. volvulus*, with the embryonic form, *M. volvulus*, is found in tumours, but cannot be traced in the peripheral blood.

Krausse (A.). **Ueber die Hirschlausfliege, *Lipoptena cervi*, L.** [Notes on *Lipoptena cervi*, L.]—*Zeitschr. Forst- u. Jagdwesen, Berlin*, l, no. 6, June 1918, pp. 268–272, 10 figs.

This is one of a series of entomological communications from the Royal Forestry Academy at Eberswalde and contains figures and morphological notes for facilitating the identification of *Lipoptena cervi*, L., a Hippoboscid fly infesting the red deer.

Jack (R. W.). **A Form of Myiasis in Cattle.**—*Rhodesia Agric. Jl., Salisbury*, xv, no. 6, December 1918, pp. 539–540, 1 plate.

This paper deals with a fly, allied to *Chrysomyia* (*Pycnosoma*) *marginalis*, bred out from maggots said to have been taken from large cavities in the subcutaneous tissues of cattle. This fly, which does not appear to have been associated with myiasis before, probably breeds as a rule in decaying meat. Whether eggs are laid, or whether the maggots are extruded alive, is unknown, but after completing their feeding they reach the ground which they penetrate, if possible, in order to pupate, the pupal stage, in the laboratory, occupying 14 days.

For the treatment of infested cattle, chloroform or hydrogen peroxide should be poured into the wound, care being taken that it reaches all the cavities caused by the maggots. Any of the carbolic disinfectants in common use may be applied, and a solution of peach leaves will be found most useful. After cleansing with any of these solutions, the wound should be dressed with carbolic ointment or Stockholm tar to assist in healing and to prevent further infestation.

Hardy (G. H.). **Notes on Tasmanian Diptera and Description of New Species.**—*Papers & Proc. R. Soc. Tasmania for Year 1917, Hobart*, 25th February 1918, pp. 60–66. [Received 4th February 1919.]

Among the Diptera dealt with in this paper, the new Tabanids described include *Pelecorhynchus igniculus*, and *P. albolineatus*. *P. montanus*, Hardy, is now considered to rank as a distinct species and not as a local race of *P. eristaloides*, Wlk., and is further described. The habitat of all these species is Cradle Mt., at about 3,700 ft. elevation. A key is given to all the known Tasmanian species of this genus.

Williams (T. H.). **Lice and Tick on Sheep.**—*Jl. Dept. Agric. S. Australia, Adelaide*, xxii, no. 3, October 1918, pp. 224–232, 7 figs. [Received 6th February 1919.]

Trichodectes sphaerocephalus (sheep louse) was probably introduced into South Australia on imported Lincoln sheep about 30 years ago. No effort was made to check the spread of the parasite till 1890, and at the present day all breeds of sheep are attacked, Merinos being the worst sufferers, and the parasite has become acclimatised even in the northern districts and breeds continuously on undipped sheep. It is calculated that there will be a decrease of from 15 to 20 per cent. in the State wool clip if sheep are not dipped and if the pest continues to increase as it has done during the past two years, to say nothing of the enormous loss of meat due to infested sheep failing to thrive.

Legislation concerning the compulsory dipping of sheep in infested areas has been in force since 1915, enacting that all such sheep must be immersed in a bath consisting of an approved arsenious preparation in which they must remain for not less than one minute. Dipping in non-poisonous carbolic solutions, or hurrying freshly-clipped sheep even through arsenious dips have proved to be of little or no value.

Under the Act a large area has been subjected to compulsory dipping regulations from September 1918 till the end of January 1919, the penalty for not complying with the gazetted notice being £10 to £50. If, after that time, sheep are still infested, they must be reported by the owner, the penalty for neglect to do so being £20 a day, under the Stock Diseases Act of 1888. Under this Act, owners, managers or agents (1) must report to the Chief Inspector of Stock or nearest inspector of stock when sheep are infested with either lice or tick [*Melophagus ovinus*]; (2) must not move infested sheep away from their usual pasture without permission of an inspector of stock; (3) must not move infested sheep along roads or reserves or allow contact with other sheep; (4) must not expose infested sheep in any saleyard, whether public or private.

The Acts and regulations which apply to the sheep louse also apply to the sheep tick, *Melophagus ovinus*.

Any inspector of stock may also place infested sheep in quarantine until such time as he is satisfied that they have been dipped and are clean.

The paper concludes with a plan of a model dipping plant.

Cleland (J. B.), Bradley (B.) & McDonald (W.). **Dengue Fever in Australia. Its History and Clinical Course, its Experimental Transmission by *Stegomyia fasciata*, and the Results of Inoculation and other Experiments.**—*7th Rept. Microbiol. Lab.* (*Govt. Bur. Microbiol.*) *for 1916*, pp. 185–232. [Extract from *Rept. Director-Genl. Publ. Health, N.S.W., for Year ended 31st December 1916.*] [*sine loco.*] [Received 12th February 1919.]

The bulk of the subject-matter of this report has already been noticed from other sources [see this *Review*, Ser. B, iv, p. 196 and vi, p. 213].

In a section dealing with Australian mosquitos as conveyors of disease the species mentioned are:—*Culex fatigans*, which is not capable of transmitting dengue fever, but which is the transmitting agent of *Filaria bancrofti*, and is apparently responsible for the distribution of this disease in Queensland; *Stegomyia fasciata*, which is responsible, and perhaps solely responsible, for the spread of dengue fever in Australia, and is, at the same time, the transmitting agent of yellow fever; *Ochlerotatus* (*Scutomyia*) *notoscriptus*, Skuse, which is widely distributed throughout Australia, but not known to convey any disease to human beings; *Ochlerotatus* (*Culicelsa*) *vigilax*, Skuse, the common bush mosquito, and *Culex sitiens*, Wied. (*Culicelsa annulirostris*, Skuse), a widely distributed species, which are not at present considered responsible for the conveyance of any disease to man; and *Anopheles* (*Nyssorhynchus*) *annulipes*, Wlk., the chief malaria transmitter in Australia and widely distributed throughout the continent.

Cleland (J. B.). **Notes on *Stomoxys calcitrans*.**—*7th Rept. Microbiol. Lab.* (*Govt. Bur. Microbiol.*) *for 1916*, pp. 237–238. [Extract from *Rept. Director-Genl. Pub. Health, N.S.W., for Year ended 31st December 1916.*] [*sine loco.*] [Received 12th February 1919.]

Stomoxys calcitrans is an exceedingly common biting fly, and is probably met with throughout Australia. It mainly attacks horses

and cattle, the lower part of the legs being the spot specially selected for feeding. It has been suggested as a possible vector of the organism of infantile paralysis, but since it rarely bites human beings, there is small likelihood of its directly conveying the virus from man to man. It is possible, however, that some domestic animals may provide a reservoir for the virus of infantile paralysis, it being well known that from time to time epidemics of illness are said to have occurred in horses at the same time as epidemics of infantile paralysis in man. It is further possible that the virus may occur and multiply in a domestic animal without materially affecting it.

Bull (L. B.). **Impetigo of the Pig.**—*S. Australia Stock & Brands Department*, [*sine loco*], [n. d.], 5 pp. [Received 12th February 1919.]

Impetigo of the pig is essentially a skin disease due to the inoculation of bacteria (*Bacillus enteritidis*, Gaertner) into the skin, lice (*Haematopinus suis*) being responsible for this transmission. There is no evidence to show that the skin becomes infected by any other means, although there is no reason to believe that this is not possible. Only the soft and tender skin of the young animal appears to be susceptible, the thicker and harder skin of adults appearing to afford complete protection.

Prevention of the disease should be easy if young animals are always kept in clean surroundings with plenty of fresh air and sunlight. A strict watch should be kept for lice and whenever they are found the styes should be thoroughly cleaned and disinfected. The animals themselves should be dipped, sprayed or hand-dressed with a 2–4 per cent. creolin solution. A 10 per cent. kerosene emulsion is also very efficient, but should not be used in very hot weather, as it is then liable seriously to injure the skin. All treatments must be repeated at least 3 times at intervals of a week to ten days.

Taylor (F. H.). **Studies in Phlebotomic Diptera, no. 1. New Species of Simuliidae and Chironomidae.**—*Australian Zoologist, Sydney*, i, no. 6, 11th November 1918, pp. 167–170, 3 figs. [Received 12th February 1919.]

The Simuliids here dealt with are *Simulium bancrofti*, sp. n., and *S. furiosum*, Skuse, only one other species, *S. victoriae*, Roub., having been described as yet from Australia. The two Chironomids described are *Culicoides townsvillensis*, sp. n., and *C. multimaculatus*, sp. n.

Mosier (C. A.) & Snyder (T. E.). **Further Notes on Tabanidae in the Florida Everglades (Dipt.).**—*Proc. Entom. Soc. Washington, D.C.*, xx, no. 8, November 1918, pp. 182–184. [Received 14th February 1919.]

Some species of *Tabanus* have the habit of congregating on the bloom, and feeding on the nectar of the saw palmetto (*Serenoa serrulata*), especially when it is shaded by the large fan-shaped leaves, males of *T. americanus*, *T. trijunctus* and *T. lineola* being found in such situations from early morning till nearly dusk. A few females also feed on the bloom. Blooms from which the leaves shading them have been cut are immediately deserted by the males of *T. americanus*

for new feeding-grounds affording greater shade or security, but neither sex of *T. trijunctus* is affected in this way. The spraying of the blooms with an arsenical solution to poison the adults that visit them for their nectar has been suggested as a possible means of controlling these troublesome flies, which however will probably continue to be detrimental to the welfare of live-stock until artificial drainage of the Everglades is undertaken.

New records of species collected at Paradise Key include *T. americanus*, Forster, *T. rufus*, P. de B., *T. turbidus*, Wied., *T. lugubris*, Macq., *T. atratus*, F., *T. melanocerus*, Wied., *T. lineola*, F., *T. costalis*, Wied., *T. flavus*, Macq., *D. ferrugatus*, F., *Chrysops plangens*, Wied., and *C. flavidus*, Wied.

MARCHAND (W.). **First Account of a Thermotropism in *Anopheles punctipennis*, with Bionomic Observations.**—*Psyche, Boston, Mass.*, xxv, no. 6, December 1918, pp. 130–135, 2 figs.

A study of Anopheline mosquitos in the region of Princeton, New Jersey, yielded only two species, namely, *Anopheles quadrimaculatus* and *A. punctipennis*. It is not definitely known to what extent the latter species is harmful, but it is doubtful whether it is a regular carrier of malaria in the northern States, where it occurs as far north as Boston. In rearing *A. punctipennis* in captivity it was found that certain green unicellular surface algae, placed in clear water, formed the most satisfactory food for that species. It has also been stated that in the Sudan microscopic fresh-water algae form the principal food of *Anopheles*; this might prove an important fact in control, as the mosquitos might be kept in check by methods aiming at destruction of the algae.

Observations upon the biting instincts of *A. punctipennis* show that they are determined mainly by thermotropism. It has previously been recorded that females of *Stegomyia albopicta* (*scutellaris*) were attracted by hot air radiating from a test-tube filled with hot water. Shed blood and perspiration were not, however, more attractive to the females of this species or of *Culex fatigans* than water. Females of *A. punctipennis* were kept in lamp chimneys and were fed on apple jelly spread out on a glass plate and covered with filter paper. It was found that the apple jelly was more readily taken if heated. In order to ascertain whether the odour of the jelly or the heat coming from it was the chief attraction, the jelly was removed from the glass plate which was then heated to a degree above the human body temperature, and replaced under fresh filter paper. The mosquitos were attracted in the same way as if food had been present, all attacking the surface of the filter paper and bending their proboscis in repeated efforts to pierce the surface of the plate. Males showed the same tropism as females, but much less strongly. As soon as the glass plate had cooled off, the mosquitos became indifferent. Upon re-heating, the same effect was observed both with the same and with other individuals. The author has since tried to confirm these facts by observations on other species of mosquitos, but as yet only hibernating females of *Aëdes sylvestris* have been used, and these did not show any trace of the thermotropic reaction observed in *A. punctipennis*. They consistently refused to bite, though various foods other than blood were readily accepted.

Females of *Anopheles* are known to bite occasionally in winter and therefore usually hibernate in stables where blood can be obtained, while species of *Aëdes*, which hibernate in cellars, seem not to bite in winter even if brought into a heated room. The absence of thermotropism would therefore be only an adaptation to the conditions of hibernation, during which no blood food is taken, and it is quite possible that *A. sylvestris* will be found to be thermotropic during the biting season, unless in this genus other tropisms are involved.

Pickels (A.). *Nigeria (Northern Provinces) Annual Medical & Sanitary Report for the Year ending 31st December 1917*, *Lagos*, pp. 107–165. [Received 17th February 1919.]

Malaria continues to attack large numbers of the younger and less experienced members of the European community in the Nigerian Northern Provinces though preventive measures against mosquitos are general. An effective method of dealing with domestic mosquitos, especially in mud huts with thatched roofs, is to drill about a dozen holes in the bottom of a native pot, mount the pot on three stones, line the bottom with stones and above the stones make a good charcoal fire. Broken native tobacco is piled up on the fire and on the top is laid a paper bag full of black, native pepper. This makes a good fumigant, and must be left in the hut, which has previously been made as air-tight as possible, for 24 hours. Upon opening the hut, all insects, including mosquitos, flies, cockroaches, earwigs, etc., have fallen to the floor, dead or stupefied, and can be swept up and burnt. About 1,800 cubic ft. can be treated at once in this way.

An outbreak of yellow fever occurred in one locality; nine Europeans contracted the disease, but no case in a native was observed. This is the first time the disease has assumed an epidemic form in the Northern Provinces.

Sleeping sickness is reported from time to time, the incidence probably being twice as great among native as among European communities. The precautions against *Glossina* are continually practised and are only limited by the means available. Instances of tsetse-fly being active by night are being reported with increasing frequency; this is perhaps owing to the more careful observation of the insect's habits. Every year the belief in the efficacy of broad, cleared roads as a preventive measure against these flies is being confirmed, and this is a measure that is bound to progress, for every indication points to the widely-spread exploitation of the country's resources after the War.

Parsons (Capt. A. C.) & Brook (Lce.-Corpl. G. R.). **The Mosquito Problem in Britain: Suggestions for a Winter Campaign against the Important Mosquitos, with Notes on Insecticides.**—*Jl. R.A.M.C.*, London, xxxii, *January* 1919, pp. 1–23.

As the most prevalent of the malaria-carrying mosquitos in England, namely, *Anopheles maculipennis*, and the most common Culicine, *Culex pipiens*, both pass the winter as adults, the females generally hibernating in cellars, cow-byres, pigstys, stables and outhouses, it is suggested that the winter would probably be the best time for dealing

with these species. Of the other two Anopheline mosquitos found in Britain, only *A. bifurcatus* is seen at all frequently in human habitations, and both this species and the much rarer *A. plumbeus* (*nigripes*) winter in the larval stage. The choice of an insecticide must be determined largely by the nature of the building to be treated and the most convenient method to suit the case. Artificial traps are not necessary in Britain except for scientific or experimental purposes, the winter resorts mentioned above acting as natural ones. As fumigants, the general use of hydrocyanic acid, chloroform, and chlorine on a large scale is not recommended on account of the danger attending them. Chlorine, however, is quick and effective in its action and inexpensive to use, but should only be employed under expert supervision. Sulphur is advocated only when a Clayton machine can be used, and when the buildings to be treated do not contain articles that are affected by sulphur dioxide. The burning of sulphur in pans is not considered so satisfactory as various other fumigants. Formalin is a popular fumigant, but must be used in strong solutions to cause death, and requires a considerable time. It is an unpleasant substance with which to work, while the after-use of ammonia, though obviating some of the drawbacks, adds to the details of the technique. Camphophenique and the various cresylic compounds offer many advantages, especially as being safe domestic remedies. Spraying is not considered preferable to fumigation where barracks and rooms in Britain are concerned. It is a troublesome operation, involving the use of special apparatus and the careful attention of the operator, and it is extremely doubtful whether it is an efficient method.

Neiva (A.) & Gomes (J. F.). **Biologia da Mosca do Berne** (*Dermatobia hominis*) **observada em todas as suas Phases.** [The Biology of *D. hominis* observed in all its Phases.]—*Annaes Paulistas de Medicina e Cirurgia, S. Paulo*, viii, no. 9, September 1917, pp. 197–209, 1 fig. [Received 12th February 1919.]

The information given here is based on observations made in nature and in the laboratory, where the complete life-cycle of the fly was obtained, and some of it has been noticed in a previous paper [see this *Review*, Ser. B, iii, p. 194]. *Dermatobia hominis* is found on horses, mules and cattle, because they attract numerous flies which the Oestrid captures, depositing its eggs on their abdomen. Some of the larvae of *D. hominis* are thus enabled to penetrate the skin of warm-blooded vertebrates and there continue to develop.

Experiments are described showing that eggs carried by Culicid, Muscid and other flies have always been laid on them by *D. hominis*. The eggs are attached by means of a strongly adhesive, quick-drying cement. The eggs sometimes found on leaves have been directly deposited there by females that have not succeeded in holding a fly they have tried to capture and are compelled to oviposit. Such eggs perish unless kept in a damp chamber. Two captive females laid 16 eggs on one *Stomoxys calcitrans*, 26 on one *Musca domestica* and 54 on another, and they also oviposited 13 times on the paper and glass of the jar, on which from 280 to 300 eggs were laid. Incubation lasted six days. The larvae remained within the eggs until the latter were brought close to the skin of a warm-blooded animal. They

endeavour to reach the skin and if successful they leave the eggs, into which they draw back if they fail, unless the skin remains near them for a long period, in which case they leave the egg before effecting contact with the skin. In a damp chamber at the ordinary summer indoor temperature this first (pre-feeding) larval stage lasted about 20 days. Some of the eggs failed to hatch, though conditions were uniform. Many of the larvae obtained were used for infesting a dog, as dogs and cattle are the animals chiefly attacked in Brazil, others being goats, sheep, cats and guinea-pigs. Penetration requires about 5 minutes, but for some hours afterwards the black spines of the larvae are visible beneath the skin. A small swelling appears during the following days. A larva that measured 1·6 mm. by 0·3 mm. at the time of penetration grew to 6 mm. by 2·3 mm. in 16 days, a first moult occurring between the third and eighth day. In three cases the larval period in the dog lasted 35, 39 and 41 days, and in another three cases the periods were 65, 65 and 74 days, probably owing to the lower temperature then obtaining. The mature larva leaves its host and undergoes the pupal metamorphosis in the ground. The infestation of the buccal and eye mucosa in man is easy to understand from the above data. Other parts of the body may be attacked when uncovered, or the larvae in eggs carried by flies may be dropped down the neck. The pupal stage was observed to vary from 64 to 78 days in 4 cases. The last of these took place at the beginning of winter, the laboratory temperature varying between 12° and 18° C. [54°–65° F.] during the day. In the Province of Rio de Janeiro, where the average temperature is higher than in São Paulo, the pupal stage required only 33–37 days from May to August. The adults emerge in the warmest hours of the day, usually between noon and 3 p.m. Mating takes place several times a day, the first occasion being within 24 hours of emergence. The average life of *D. hominis*, from the date of oviposition to the death of the adult, varied from 120 to 141 days.

In Central America and Venezuela *Janthinosoma* (*Psorophora*) *lutzi* is the sole carrier known of the eggs of *D. hominis* [see this *Review*, Ser. B, v, p. 18]. In São Paulo the following carriers were noted: *Janthinosoma* (*Psorophora*) *posticata* (*musica*, auct.), *J.* (*P.*) *lutzi*, other Culicids, *Musca domestica*, *Stomoxys calcitrans*, a Tabanid, and sylvan Muscids.

DE FIGUEIREDO PARREIRAS HORTA (P.). **Uma nova Molestia de Bovinos e Ovinos.** [A new Disease of Cattle and Sheep.]—*Rev. Veterinaria e Zootechnia, Rio de Janeiro*, viii, no. 2, 1918, pp. 3–32. [Received 17th February 1919.]

A full description is given of a haemorrhagic gastro-enteritis of cattle and sheep in the Brazilian States of Minas Geraes and Rio de Janeiro, which is believed to be carried by ticks.

MOORE (W.). **The Effect of Laundering upon Lice** (*Pediculus corporis*) **and their Eggs.**—*Jl. Parasitology, Urbana*, v, no. 2, December 1918, pp. 61–68.

The washing of rough cotton goods at a temperature of 180° F. (82·2° C.) for 15 or 30 minutes will destroy lice, *Pediculus humanus* (*corporis*), and their eggs. Any eggs escaping destruction in the

washing process would be destroyed later during drying in the hot air tumbler. Cotton khaki clothing washed at a temperature of 120° F. to 130° F. (48·8° to 54·4° C.) for 15 minutes would not retain any undestroyed lice in the active stages, but the eggs would not all be killed. Washing continued for 30 minutes, however, would result in the destruction of all of these also, as would also the drying of such uniforms in the hot air tumbler.

In woollen goods, neither lice nor their eggs were destroyed by the regular washing or by drying, which was effected at room temperature to avoid shrinkage. In view of the unsatisfactory results obtained by adding a chemical such as cresol or lysol to the washing suds, the following procedure for the laundering of woollen goods to destroy both lice and eggs is recommended. Infested garments should be washed at a temperature of 120° F. (48·8° C.) and this should not fall below 115° F. (46·1° C.) during the washing period of 15 minutes, this treatment destroying the active stages without the use of any special chemicals. The garments are then treated in the usual manner until perfectly dry, when they should be placed in the hot air tumbler at a temperature of 150°–170° F. (65·5° C. to 76·6° C.) for 10–15 minutes to destroy the eggs. This method makes it possible to launder woollens without shrinkage and to destroy lice and eggs without the use of a special chemical.

Hadlington (J.). **The Fowl Tick.**—*Agric. Gaz. N.S.W., Sydney*, xxix, no. 12, 2nd December 1918, pp. 892–896, 2 figs.

The fowl tick [*Argas persicus*], which is treated by many poultry keepers as merely a blood-sucking pest, is also the transmitter of a blood parasite, *Spirochaeta marchouxi* vel *gallinarum*, which causes a fever that often either kills the fowl outright, or weakens it so that it dies from anaemia. Individuals that survive become immune to further infections.

In order to eradicate this tick, fowl-houses and roosts should be properly constructed of corrugated galvanised iron, painted to keep them cool, or of well-seasoned, closely built hardwood palings. Infested poultry houses should be thoroughly sprayed with kerosene emulsion by means of a force pump, so that every crack and crevice may be reached, two or three applications being given at intervals of a day or two. The emulsion should be made by slowly adding 1 gal. kerosene to 1 gal. of boiled soft water in which 8 oz. of soft soap have been dissolved. After stirring briskly for 10 minutes, 10 gals. soft water should be slowly added. A quart of kerosene tar added to the emulsion in place of the same quantity of the kerosene renders it more effective, and it may also be used to paint the roosts as an additional preventive.

Boyé (G.) & Guyot (R.). **Contribution à la Lutte contre les Mouches.** [A Contribution to the Campaign against Flies.]—*Bull. Acad. Méd., Paris*, lxxxi, no. 3, 21st January 1919, pp. 80–84.

In experiments against fly larvae a mixture of potassium permanganate and formalin was found to be particularly successful. The

poisons used against the adult flies nearly always contained sugar or syrup as a bait. The best poisons were black arsenic and castor oil. The latter may be rendered almost instantaneously fatal to flies by the addition of a little croton oil [2 drops per 30 grms. of castor oil]. Ground-nut oil was useless as a poison. A small amount of black arsenic added to a plateful of water quickly kills the flies attracted to it. Arsenious acid is very much less efficacious.

SIKORA (H.). **Beiträge zur Kenntnis der Rickettsien.** [Contribution to the Knowledge of *Rickettsia* spp.]—*Archiv. f. Schiffs- u. Tropen-Hyg., Leipzic*, xxii, no. 24, December 1918, pp. 442–446.

Ricksettsia melophagi, which occurs in the stomach lumen and on the surface of the stomach epithelium of the sheep louse, *Melophagus* [*ovinus*], is abundant in mature individuals but rare in young ones. According to experiments described in this paper the infection is hereditary in *Melophagus*. Clothes-lice did not contract infection when allowed to feed on sheep. From cat fleas bodies were obtained that are similar to *R. wolhynica* and are provisionally named *R. ctenocephali*. *Rickettsia*-like forms were also obtained from mouse fleas, but both the rat flea and human flea appear to be uninfected.

KUCZYNSKI (—). *Bacterium proteus* X_{19} **(Weil-Felix) in der Kleiderlaus.** [*Bacterium proteus* X_{19}, Weil-Felix, in the Body-Louse.] —*Archiv. f. Protistenkunde, Jena*, xxxviii, no. 3, 27th April 1918, pp. 376–391, 4 figs.

The question of the aetiology of typhus fever has not yet been solved. Part of the difference of opinion centres round *Bacillus typhi-exanthematici*, *Rickettsia prowazeki* and *Bacterium proteus* X_{19}, each of which has been claimed to be the causal agent. The author draws attention to the contradiction involved in the assumption that sterile lice acquire *Rickettsia* from healthy human individuals, for this presumes an accumulation of such *Rickettsia* in the blood-stream of the human host. The importance of *Rickettsia prowazeki* is not invalidated by the *Rickettsia* findings in Volhynian fever. In order to solve the question of the relative importance in the pathogenesis of the disease of the various organisms found in typhus-infected blood the method of artificial infection of lice with pure cultures is suggested and has been carried out in the case of *Bacterium proteus* X_{19}. It was ascertained that X_{19} and *Rickettsia* are not identical and that X_{19} shows a characteristic growth in size in lice that led to the death of the experimental lice within 72 hours or less. It is probable that a contemporaneous infection of lice with *Rickettsia* impedes the development of X_{19}. It is very probable that the rod- and thread-forms in lice infected with *Rickettsia* do not belong to that organism but to X_{19}. As a result of a personal experiment in which 72 lice artificially infected with X_{19} were allowed to feed during a period of 3 weeks on the author it appears to be highly improbable that X_{19} is pathogenic to a healthy man. Some clinical observations however suggest that a primary illness or great general debility may render X_{19} pathogenic to a certain degree.

PAEZ (F. R.). **El Paludismo en el Estado Bolivar.** [Malaria in the State of Bolivar, Venezuela.]—*Soc. de Med., Ciudad Bolivar*, 15th June 1917, 11 pp. [Abstract in *Bull. Inst. Pasteur, Paris*, xvi, no. 5, 15th March 1918, p. 164.]

The State of Bolivar, Venezuela, still suffers from malaria throughout its extent, though the disease has decreased in certain localities where virgin soil has been brought under cultivation. The town of Bolivar itself is now healthy. *Anopheles* (*Cellia*) *albimanus* and *A.* (*C.*) *argyrotarsis* are the Anophelines held to be responsible for transmission.

ECKSTEIN (F.). **Zur Systematik der einheimischen Stechmücken.** [A Contribution to the Systematic Study of Mosquitos native to Germany.]—*Centralbl. Bakt., Parasit. u. Infektionskrankheiten, Jena*, lxxxii, no. 2, 12th October 1918, pp. 57–68.

This paper is one of a series of reports on mosquitos in Germany [see this *Review*, Ser. B, vi, p. 211]; it deals with species found in Alsace and is a preliminary study of the females intended to facilitate identification by recording easily recognisable and stable characters. Existing keys are unsatisfactory, as male characters have been given in the case of females and *vice versa*, and because markings that are readily liable to damage, such as those of the thorax, have been used. An attempt has been made to avoid these defects in the key given here to the female mosquitos found near Strasburg. In this key the AËDINAE are treated as a sub-family distinguished from the CULICINAE on the form of the end of the abdomen.

Of the species mentioned the following are briefly described:—*Anopheles maculipennis*, Meig., *A. bifurcatus*, L., *A. plumbeus*, Hal. (*nigripes*, Staeg.), *Theobaldia* (*Culiseta*) *annulata*, Meig., *T.* (*C.*) *glaphyroptera*, Schiner, *Culex pipiens*, L., *C. hortensis*, Fic. (*territans*, Wlk.), *Theobaldia* (*Culicella*) *morsitans*, Theo., *T. fumipennis*, Steph. (*theobaldi*, de Meij.), *Ochlerotatus* (*Culicada*) *vexans*, Meig., *O. maculatus*, Meig. (*cantans*, Meig.), *O. annulipes*, Meig., *O. dorsalis*, Meig., *O. ornatus*,, Meig., *O. geniculatus*, Oliv. (*lateralis*, Meig.), *O. diversus*, Theo., *O. nigrinus*, sp. n., *O. nemorosus*, Meig., and *Aëdes cinereus*, Meig. *O. nigrinus* was found in meadows in company with *O. vexans* and *O. dorsalis*. It lay its eggs on damp ground, hibernates in the egg-stage and may have several generations in a year. Besides differences in the egg, larva and male genitalia the new species differs externally from *O. ornatus* in the absence of the glittering femoral spot, from *O. nemorosus* in the presence of shining white abdominal bands, and from both these species in the remarkable black ground-colour of the entire body. Most of the above species are new to Alsace.

WARBURTON (C.). **Notes on Ticks. Being Descriptions of Two New Species of *Ornithodorus* and of the hitherto unknown Female of *Hyalomma monstrosum*.**—*Parasitology, Cambridge*, x, no. 2, January 1918, pp. 284–287, 3 figs.

The female of *Hyalomma monstrosum*, Nutt & Warb., is described for the first time from a specimen taken from *Sus cristatus* in company with *H. bispinosa* var. *intermedia* and *Rhipicephalus haemaphysaloides*

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in Bengal. The male was described in 1907 from a specimen taken from a horse in the Chin Hills, east of Chittagong, and two have since been taken from the buffalo at Agul, Bengal.

Ornithodorus piriformis, sp. n., is described from 15 specimens taken at a height of 4,200 feet from an unknown host in the Satara District, Bombay, and *O. asperus*, sp. n., from a single specimen taken on the Bileck Steppe, Mesopotamia, from an unrecorded host.

NUTTALL (G. H. F.). **The Pathological Effects of *Phthirius pubis*.**—*Parasitology, Cambridge*, x, no. 3, April 1918, pp. 375–382.

Compared with *Pediculus humanus*, the part played by *Phthirius pubis* in pathology is inconsiderable, because (1) it is not known to convey any infective disease; (2) it is not so prevalent, according to Boston statistics only about 13 per cent. of verminous persons admitted to hospital being found infested with it; (3) it produces, on the whole, only slight effects.

NUTTALL (G. H. F.). **The Biology of *Phthirius pubis*.**—*Parasitology, Cambridge*, x, no. 3, April 1918, pp. 383–405, 9 figs.

The habits of *Phthirius pubis* differ markedly from those of *Pediculus humanus* in respect of its relative immobility upon its host, the insect remaining attached and feeding for hours or days on one spot without removing its mouth-parts from the skin into which it has bored them. Hitherto it has not been recorded as occurring on any host other than man, but there are now two instances of such occurrence on the dog, one from Lake Nyasa, 1910, and one from Panama, 1917. The parasite is usually confined to the pubic and peri-anal regions, though it may become disseminated practically all over the body, occurring occasionally on children and rarely on adults upon the head, especially upon the eyelashes and eyebrows, rarely on the scalp, and occasionally in the beard. The feeding habit of *P. pubis* is practically continuous, the insect only ceasing to feed when it moults, which it does *in situ*, this habit explaining why it dies so quickly when removed from the host. The life-cycle is completed in from 22 to 27 days, hatching taking 6 to 8, development to the adult 15 to 17, and the pre-oviposition period being 1 to 2 days.

COLES (A. C.). *Spirochaeta icterohaemorrhagiae* **in the Common Rat in England. With Remarks on the Minute Structure of these Leptospira (Noguchi).**—*Parasitology, Cambridge*, xi, no. 1, November 1918, pp. 1–9, 2 plates.

In 1916, Japanese observers stated that *Spirochaeta icterohaemorrhagiae*, the organism present in infectious jaundice, was transmitted probably from rats to man by means of the urine of rats, directly or indirectly. They carefully examined house and ditch rats in the city, and rats in the coal mines where Weil's disease prevails, and found 39·5 per cent. to contain highly virulent pathogenic spirochaetes in their kidneys. The following year they stated that the organisms cannot be demonstrated in the blood and liver, but in the urine of

rats harbouring *S. icterohaemorrhagiae* in the kidney, they were present without exception, and therefore the extermination of rats and field mice is a highly important prophylactic measure against Weil's disease. The chemical composition of the soil and water plays an important part in the development of *S. icterohaemorrhagiae* and consequently in the spread of the disease of which it is the causal agent.

BODKIN (G. E.). **The Biology of *Amblyomma dissimile*, Koch, with an Account of its Power of Reproducing Parthenogenetically.**—*Parasitology, Cambridge*, xi, no. 1, November 1918, pp. 10–17, 2 plates, 1 fig.

Amblyomma dissimile is a well known tick in British Guiana, the engorged females being found on the head of *Bufo marinus* (bull-frog) attached immediately between the eyes. The parasite is only of indirect and very small economic importance, its attachment sometimes resulting in the death of the host, which is a great insect-eater.

The hosts of this tick are toads, iguanas, lizards and several species of snakes, and probably the adult females are capable of engorging on most cold-blooded animals, but not on warm-blooded ones, though the larvae and nymphs can do so.

The total life-cycle of *A. dissimile*, provided that each stage promptly finds a host, takes about 153 days, but under natural conditions this period must be very greatly lengthened. In the laboratory oviposition proceeded regularly for about 16 days. One unfertilised female tick lived 496 days and laid fertile eggs. In nature both sexes occur together on the same host, the examination of 30 infested toads yielding 46 males and 9 females. In the laboratory four generations were raised parthenogenetically from two original females, no diminution either in size or vigour being noticed, the results showing that such generations consist entirely of females, while fertilisation results in the production of a small percentage of males.

GRAHAM-SMITH (G. S.). **Hibernation of Flies in a Lincolnshire House.**—*Parasitology, Cambridge*, xi, no. 1, November 1918, pp. 81–82.

Towards the end of October 1917 a large and very old house near Boston, Lincolnshire, was found to be very heavily infested with hibernating flies, the window frames, after fumigation and removal of the window sashes yielding as much as a bucketful of dead flies from a single window. Coccinellids were also present in large numbers. Early in November the window frames were fumigated with hydrocyanic acid gas, and all the joints and cracks were syringed first with carbon bisulphide and then with a saturated solution of crude naphthaline in methylated spirit. No flies were seen for a few days, but by the beginning of December they were as numerous as ever. A second treatment and fumigation took place in December and an examination in January revealed no living flies. It was stated that the trouble has recurred every winter for the past 24 years, the flies appearing towards the end of July and suddenly disappearing about April.

The following insects were represented :—Diptera, *Musca autumnalis* (*corvina*), *Pollenia rudis*, *Pyrellia eriophthalma*, *Limnophora*

septemnotata and *Culex pipiens*; and the Chalcids, *Stenomalus muscarum* and *Pteromalus deplanatus*. The most numerous and troublesome fly was *M. autumnalis*, while *L. septemnotata* occurred mainly in certain rooms, the outer walls of which were covered with ivy.

An unoccupied house near Cambridge in March 1918 was found to contain hundreds of living and dead *P. rudis*, especially in rooms facing west.

Peacock (Lieut. A. D.). **The Structure of the Mouth-parts and Mechanism of Feeding in** *Pediculus humanus*. — *Parasitology, Cambridge*, xi, no. 1, November 1918, pp. 98–117, 2 plates, 6 figs.

The information contained in this paper was obtained during investigations to ascertain whether *Pediculus humanus* is a carrier of Weil's disease [*Spirochaeta icterohaemorrhagiae*]. Though the enquiry did not demonstrate the presence of the spirochaete in the body-louse, the author hopes that this description of the mouth-parts and feeding mechanism will be of use to investigators engaged in the study of the transmission of disease by lice.

Nuttall (G. H. F.). **The Biology of** *Pediculus humanus*. **Supplementary Notes.**—*Parasitology, Cambridge*, xi, no. 2, February 1919, pp. 201–220, 1 plate, 1 fig.

Experiments to determine the reaction of lice (*Pediculus humanus*) to colour and light demonstrated that, when illuminated by rays of light falling vertically upon them, they seek the shade, and a black surface in preference to a white one. Experiments with lice upon a polychrome carpet yielded no evidence of a preference for any particular colour.

Investigations on the influence on lice of temperature conditions in clothing and the absorption of radiant heat by cloth showed that man's clothing, depending on its colour, varies in its capacity for absorbing radiant heat, therefore in warm weather black cloth, which absorbs the maximum of heat rays, will prove inimical to lice and cause them to wander away to where it is cooler so as to escape (a) the direct effect of heat, and (b) its indirect effect in producing perspiration in man, for lice object to excessive moisture in the vicinity of man.

That pigmentation in *Pediculus* is not an hereditarily transmitted character, but that its presence depends entirely upon the nature of the background upon which the insect lives, and that it is a character that may be acquired in a couple of days, was proved by the experimental raising of *P. humanus* on black, grey, white and coloured backgrounds.

Bacot (A.) & Talbot (G.). **The Comparative Effectiveness of certain Culicifuges under Laboratory Conditions.**—*Parasitology, Cambridge*, xi, no. 2, February 1919, pp. 221–236, 1 fig.

The methods and experiments devised for the purpose of determining for the War Office the comparative efficiency of certain culicifuges show that, while some of the preparations afford a high degree of protection, others are of dubious value. Since any preparation which

will repel the attacks of mosquitos, if only for a short period, is a desideratum in the case of soldiers in malarious countries, the discovery of an effective culicifuge would be of great importance, as troops are necessarily exposed to risks not incurred by civilians.

The mosquito used in these experiments was *Stegomyia fasciata*, F., the choice of which was due to the possession of a West African stock of this species, and to the fact that it can be easily reared in captivity; and though it does not necessarily follow that the value of the preparations tested will be the same against Anophelines in the field as against *S. fasciata* under laboratory conditions, yet the work may afford a practical comparative guide. The females of this species are renowned for their blood-sucking proclivities, feeding just as well under laboratory conditions as when at liberty, the season of the year making no difference to either breeding or feeding, provided that temperature and humidity are favourable.

Of the preparations tested, 12 were prepared with wax, 3 were of a greasy nature, 3 were liquids, and 3 were prepared as soap, and it was found that those made up with grease or as soft soaps had the advantage in ease and economy of application, though waxy preparations have a great advantage as regards endurance. Fluids, especially highly volatile ones, require much more skill and care in application if waste is to be avoided, while hard soaps are best applied by first wetting the skin, and they suffer from the fact that perspiration will remove them more readily than it does either wax or grease.

An ideal culicifuge should (1) spread easily so as to enable it to be quickly and evenly applied over the exposed area, while (2) it must be of such a consistency that it will adhere firmly to the skin, and (3) retard volatilisation. The individual tastes of persons in regard to odours are varied and their dislikes so intense that it is difficult to advise as to the best of a number of preparations giving approximately equal degrees of protection. Among troops and others compulsorily subjected to measures of malaria control, a preparation, the odour of which is greatly disliked, might fail because the majority would not apply it, or would do so indifferently, a difficulty that might be met by adopting two classes of preparations.

In testing a preparation, the arm from wrist to elbow was coated with it as evenly as possible, the hand being covered by a rubber glove, so as to restrict the bites to the forearm. The arm was then covered by the sleeve for 15 minutes to allow of some volatilisation, before exposure in the cage for 10 minutes. In a second series of experiments the procedure was the same, except that the arm, after treatment, was exposed to the air for from 2–5 hours before insertion in the cage. Each test was controlled by inserting, after a short interval, the other and untreated arm in the same cage.

In the first series of trials 8 preparations out of a total of 22 gave satisfactory results. Their active ingredients were oil of cassia and camphor; oil of cassia and peppermint; oil of eucalyptus and citronella with phenol; crude naphthaline (coke oven) and camphor; crude "parasitox"; light wood oil; oil of turpentine; Lawson's anti-mosquito compound. None of the preparations gave complete protection when tested more than 2 hours after application, the most efficient being oil of cassia and camphor, oil of turpentine, oil of

cassia and peppermint, light wood oil, and crude naphthaline and camphor. Observations on the behaviour of the mosquitos during the tests suggest that the protection afforded does not result from a dislike of the insects to the culicifuge, but to its obscuring the attractiveness of the human odour.

It being a matter of general belief that some individuals are more prone to mosquito attacks than others, the point was tested experimentally and showed that the factor of preference on the part of the mosquito does exist.

HALL (M. C.). **A Note regarding Myiasis, especially that due to Syrphid Larvae.**—*Arch. Internal Med., Chicago, Ill.*, xxi, no. 3, 15th March 1918, pp. 309–312.

A number of published cases are enumerated in which myiasis has apparently been due to Syrphid larvae, which are stated to have been present seventeen times in the digestive tract of man, once in the nostrils of man and twice in the vagina of cattle.

MOORE (W.). **Impregnation of the Underwear as a means of Controlling the Clothes Louse.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxxi, no. 7, 17th August 1918, pp. 530–531.

The experiments briefly described in this paper showed creosote and heliotropine to be the two most favourable compounds tested for impregnating underwear against *Pediculus humanus*. A 10 per cent. solution of creosote in lubricating oil, used at the rate of 1 c.c. to 8 square inches of material, worn next to the skin, was effective for 24 hours, after which it lost its toxicity. With heliotropine, used at the rate of 1 grm. with cocoa butter 3 grms. (dissolved in ether, carbon bisulphide or benzine) per 48 square inches of material, the underwear could be worn for 168 hours without loss of toxicity.

To have lasting qualities chemicals must not be less volatile than a compound boiling between 300° and 350° C., while the most toxic compounds are those with boiling points of 265° C. or lower; heliotropine has a boiling point of 263° C. It is said to kill 100 per cent. of the lice within 12 hours, but no mention is made of its effect on the eggs.

GEIGER (J. C.), PURDY (W. C.) & BATES (L. I.). **Malaria Endemicity of the Rice Districts of Louisiana and Arkansas, with some Observations on Types of Mosquitoes breeding therein.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxxi, no. 16, 19th October 1918, pp. 1283–1285, 1 map.

Anti-malarial work near an aviation field among rice-fields is described. As it is not yet possible absolutely to control mosquitos in rice-fields, recourse was had to dealing with the human carrier and to efficient screening. These measures rendered the malaria incidence negligible, and were very necessary owing to the persistent breeding of *Anopheles quadrimaculatus*. This mosquito was first found in the latter part of June and by 10th July had superseded *A. crucians* and *A. punctipennis*, which were the only species found

early in June. When the water became stagnant through partial draining, or by stopping of the pumps, *A. quadrimaculatus* was apparently superseded entirely by species of *Culex*, though only an occasional *Culex* could be found when *A. quadrimaculatus* was abundant.

SOLLMANN (T.). **The Spreading Power of Coal Oils.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxxi, no. 19, 9th November 1918, p. 1553.

The spreading power of oils on water is important in their use against mosquito larvae. This depends largely on the presence of asphalt-like products which most crude oils contain in sufficient quantity. Some, however, and especially refined oils, need the addition of asphalt. Kerosene requires about 0·1 per cent. of asphalt varnish. If kerosene is dropped on a dish of water, it collects into rather small plaques and spreads very slowly, if at all. If the asphalt varnish has been added the kerosene spreads at once over the entire surface of the water.

PLOTZ (H.). **The Importance of the Louse Problem.**—*Jl. Amer. Med. Assoc., Chicago, Ill.*, lxxii, no. 5, 1st February 1919, pp. 324–326, 2 figs.

The fundamental principles of exterminating lice are reviewed, it being pointed out that the virus contained in the excreta of the louse must be destroyed as well as the insect and its eggs. Steam is accepted as the best agent. The plan adopted against the introduction of epidemic diseases by the U.S. Army in connection with demobilisation is described and an account is given of a plant capable of freeing 260 soldiers and their equipment from lice in one hour.

MANN (W. L.) & EBERT (E. C.). **Some suggested Improvements in Methods of Petrolization of Mosquito-breeding Areas.**—*Military Surgeon, Washington, D.C.*, xliii, no. 5, November 1918, pp. 543–545, 3 figs.

Oil-soaked sawdust appears to provide a satisfactory method of securing an equal distribution of oil. The loose, dry sawdust is soaked in oil for 24 hours and distributed on the surface of the mosquito-breeding areas by hand. Where the areas are inaccessible owing to floatage and other conditions, the oiled sawdust may be tied in paper bags and the bags thrown at random into the floatage. To retard the flow of the sawdust down running streams a floating boom should be placed across the stream at intervals of 50–100 feet. These booms are made of beams, 1 foot by 2 feet and with a length depending on the width of the stream. Both ends are anchored to the shore with a cord allowing for the rise and fall of the water. The boom should be in the form of an angle with the apex pointing downstream. In this angle the sawdust accumulates. A 1-inch gap in the apex allows the sawdust to escape and it goes down to the next boom where it is again retarded.

As a substitute for oil-drippers the oil-soaked sawdust cage and the automatic oil-bubbler are employed. In the case of the former, the box should be placed in a stream so that only $\frac{1}{8}$–$\frac{1}{4}$ is submerged,

the pressure of the unsubmerged portion forcing the oil out. A few cups of oil must be added occasionally. In some instances this device was effective for 2 and 3 weeks without renewal of oil.

The automatic oil-bubbler is devised to permit it to be completely submerged, the oil being allowed to come up in bubbles. The best size is a can of 2 or 3 gallons capacity. Two spigots are fitted to the top, one serving as an oil outlet and the other as a water inlet. The spigot serving as a water inlet has a ½–1 inch pipe attached that extends almost to the bottom of the can and it is the difference between the weight of the column of water in this pipe and an equal length column of oil that causes the flow. A third spigot allows the water to be drained from the can when all the oil has been replaced.

WHITE (M. J.). **Oiling by Capillarity and by Oil-soaked Sawdust in Mosquito-Control Work.**—*Military Surgeon, Washington, D.C.*, xliv, no. 1, January 1919, pp. 103–104, 6 figs.

For continuous oiling the capillarity oiler is used. This is made of an old tin can suspended from a stake and provided with a wick of 6-ply jute binder twine, one end of which is fastened inside the can while the other hangs in the water. To retard the flow of oil the stream is obstructed by a float, which is an inch-square stick held in place by two stakes inclined downstream so as to permit rise and fall. Oil-soaked sawdust is distributed by sowing so that each particle acts as an oiling focus. For temporary collections of water such as are found in cart tracts and hoof-prints, such sawdust is very useful.

SWELLENGREBEL (N. H.). **Beschrijving van drie nog niet of onvoldoende bekende Larven van Ned.-Ind. Anophelinen.** [A Description of Three as yet unknown or imperfectly known Larvae of Anophelines of the Dutch East Indies.]—*Geneeskundig Tijdschr. Nederlandsch-Indië, Batavia*, lviii, no. 3, 1918, pp. 398–400.

The larvae of *Anopheles* (*Myzorhynchus*) *albotaeniatus*, *A.* (*Myzomyia*) *aconitus* and *A.* (*Neomyzomyia*) *leucosphyrus* are described. The first occurs in slow-running water containing little vegetation and many dead leaves; the second, which chiefly differs from the larva of *A.* (*Myzomyia*) *minimus* in the presence of shorter filaments on the palmate hairs, is mostly found in running water; the third occurs in small pools in primeval forests and nipa palm plantations near the coast, but always in fresh water.

MANGKOEWINOTO (R. M. M.). **Anophelinen van West-Java.** [Anophelines from West Java.]—*Geneeskundig Tijdschr. Nederlandsch-Indië, Batavia*, lviii, no. 4, 1918, pp. 462–498, 2 plates.

The imagines and larvae of the following Anophelines taken in West Java are described with a view to facilitating their identification:—*Anopheles* (*Myzorhynchus*) *umbrosus*, *A.* (*M.*) *barbirostris*, *A.* (*M.*) *albotaeniatus*, *A.* (*M.*) *sinensis*, *A.* (*Nyssorrhynchus*) *fuliginosus*, *A.* (*N.*) *jamesi*, *A.* (*N.*) *schüffneri*, *A.* (*N.*) *maculatus*, *A.* (*Myzomyia*) *aconitus albirostris*, *A.* (*M.*) *ludlowi* (*vagus*), *A.* (*M.*) *rossi*, *A.* (*M.*) *rossi indefinitus*, *A.* (*Neomyzomyia*) *punctulatus*, *A.* (*N.*) *leucosphyrus*, *A.* (*Cellia*) *kochi* and *A.* (*Stethomyia*) *aitkeni*.

Among the keys given is one to the characters distinguishing *A. fuliginosus*, *A. jamesi* and *A. schüffneri*, and another to those of *A. rossi*, *A. rossi indefinitus* and *A. ludlowi*.

With the exception of *A. umbrosus* the breeding-places of these mosquitos were usually in sunny situations; the larvae of *A. barbirostris*, *A. rossi*, and *A. kochi* are sometimes found in very shady spots. They may be found in turbid water, but prefer clear water. During these investigations it was remarked that the larvae were not found in containers that were not in direct communication with the ground. Even *A. rossi*, which occurs nearly everywhere, was not found in empty tins, coconut shells, etc. In daylight none of these Anophelines appear to attack man, but they are very troublesome in the evening in and around dwellings. During a month's stay in a malarial district the author noticed that at twilight some examples of *A. kochi*, *A. fuliginosus*, *A. rossi* and *A. aconitus* came indoors, while *A. sinensis* became abundant at about 7.30 p.m. and all the former species then disappeared slowly. On the following morning much larger numbers of *A. aconitus* are to be found than were observed at twilight, so that this mosquito probably enters at midnight or later. Though Anophelines attack man in or near dwellings from twilight onwards, they do not appear to do so at their breeding-places. Bats and birds were noticed at the breeding-places apparently occupied in capturing mosquitos.

FLU (P. C.). **Het een en ander over Malaria, speciaal over Drainage als een Middel te harer Bestrijding.** [Various Notes on Malaria, especially regarding Drainage as a means for combating the Disease.] — *Geneeskundig Tijdschr. Nederlandsch-Indië, Batavia*, lviii, no. 4, 1918, pp. 439–461.

After reviewing the discovery of plasmodia as the causal agents of malaria and the rôle played by certain Anophelines in transmission, the various measures adopted against mosquitos are mentioned. The drainage systems resorted to in different parts of the world are briefly described, and it is pointed out that systems that are satisfactory from an agricultural or sanitary point of view are not necessarily so as regards the prevention of malaria.

STRISOWER (R.). **Experimentelle und klinische Beiträge zur Febris Quintana.** [Experimental and Clinical Contributions concerning Five-Day Fever.]—*Münchener Med. Wochenschr., Munich*, lxv, no. 18, 30th April 1918, pp. 476–480.

The data recorded in this paper support the view that the virus of five-day (Volhynian) fever is carried in the blood and is transmitted by lice. It is not possible to determine the length of the incubation period. Out of 9 persons exposed to infection 5 contracted the disease. In 2 of these cases incubation took 60 days and there was one case each of 43, 34 and 14 days. This variation is probably due to the degree of virulence of the causal organism [see also this *Review*, Ser. B, vi, pp. 56, 58].

DOFLEIN (F.). **Weitere Mitteilungen über mazedonische Malariamücken.** [Further Communications on Macedonian Anophelines.]—*Münchener Med. Wochenschr., Munich*, lxv, no. 44, 29th October 1918, pp. 1214–1216.

Besides *Anopheles maculipennis*, Mg., and *A. palestinensis*, Theo. (*superpictus*, Gr.), mentioned in a previous paper [see this *Review*, Ser. B, vi, p. 191], *A. bifurcatus* has been found in Macedonia, where its larvae are probably able to hibernate, which apparently is not normally the case with the other species. So far the Danube region of Rumania and Bulgaria is the only area where the author has found *A. pseudopictus*. *A. palestinensis* is the typical form in the ravine streams near Uskub, Veles, Monastir, Lake Doiran, etc., and its larvae are always found with their posterior-ends applied to the rocky sides of the streams and their heads reaching into the current. This habit renders useless draining and oiling, which have proved very successful in Macedonia against the other species. Mention is made of the fact that algae exposed under water to strong sunlight give off bubbles of oxygen enabling the larvae to remain submerged right into the night, when they are compelled to breathe at the surface. *A. palestinensis* may be dealt with by erecting dams to permit the accumulation of sufficient water to flush the stream bed from time to time. Owing to the great quantity of loose stones and rubble in the ravines even a fairly large stream disappears after some distance. In the pools between the running water and the dry bed are the breeding-places of the Anophelines. Flushing carries the larvae down to the dry stones, where they perish. It is said that the Bulgarian military authorities adopted the author's plan with great success in a number of cases and that the walls also proved of great value in preventing landslides of the loose stones and in assisting irrigation. Wide climatic differences exist between north and south Macedonia and between localities at different altitudes, and these result in Anopheline development in the south being advanced by 10 to 14 days. The males of *A. maculipennis* and *A. palestinensis* die early in the winter; it is the fertilised females of the last autumn generation that hibernate in caves, houses, cowsheds and stables. Contrary to many statements, they were constantly found in stables. As a rule the hibernating females remain in a torpid condition on the walls, but if disturbed, they may fly and bite in mid-winter. It is, however, chiefly in spring that they may be seen in warm rooms, and if these be dark, they may feed during the daytime.

PITTALUGA (G.) & DE BUEN (S.). **Especies españolas del Genero *Phlebotomus*.** [Spanish Species of the Genus *Phlebotomus*.]—*Bull. R. Soc. Española Hist. Nat., Madrid*, xviii, nos. 7–8, July-October 1918, pp. 377–385.

This paper adds some additional data to that published in a previous article [see this *Review*, Ser. B, vi, p. 49]. To the three species of *Phlebotomus* recorded from Spain, the authors now add *P sergenti*, which is stated not to have been previously recorded outside Africa [see however this *Review*, Ser. B, vii, p. 30]. Descriptions of the species are given, and recent literature on the subject of their known and suspected connection with various diseases is briefly reviewed.

ROUBAUD (E.). **Rythmes physiologiques et Vol spontané chez l'*Anopheles maculipennis*.** [Physiological Rhythm and spontaneous Flight in *Anopheles maculipennis*.]—*C. R. hebdom. Acad. Sci., Paris*, clxvii, no 24, 9th December 1918, pp. 967–969.

The flight of *Anopheles maculipennis* seems to respond to certain laws with a mechanical precision. In the laboratory it remains motionless, apparently insensible to abrupt alternations of light and darkness, during the whole day, but at the beginning of twilight it suddenly springs into full flight. This takes place always at the same time, so exactly that it is possible to regulate one's watch by it, if the light conditions remain the same. The period of flight, which is the dangerous time from a malarial point of view, never extends in captivity beyond the first two hours of the night, throughout the rest of which the mosquito remains motionless, showing no tendency to become active at dawn. Under normal conditions, therefore, *A. maculipennis* passes 20–22 hours of the 24 in a state of complete repose.

CROLL (D. G.). **Filariasis among Australian Troops.**—*Brit. Med. Jl., London*, no. 3027, 4th January 1919, p. 28.

Of 4,000 Europeans admitted to Brisbane hospital in 1909 and 1910, 11·5 per cent. were found to be suffering from filariasis, though practically none of them showed symptoms of the disease, nor did they appear to suffer any inconvenience from the parasite in the blood. From this it may be concluded that about 10 per cent. of the population of southern Queensland are thus infested. Symptoms of the affection are, however, comparatively rare, though cases of filarial lymphangitis, chyluria, and filarial adenitis are occasionally seen. Cases of hydrocele, lymphocele, and deep intramuscular abscesses of obscure origin are notably prevalent, but filaria can rarely be found in the blood in these cases. Elephantiasis is unknown.

Various methods have been tried in Queensland to abolish the parasite from the blood, but none have as yet proved to be of definite value. It is found that the parasite disappears from the blood in about 4 years if there is no re-infection. The most successful prophylactic measure is the systematic use of mosquito nets.

HESSE (E.). **Sur la Présence dans le Dauphiné de l'*Anopheles nigripes* Staeger.**—*Arch. Zool. Expér. Notes et Revue, Paris*, lvii, no. 2, pp. 32–35, 2 figs.

The capture of *Anopheles plumbeus* (*nigripes*) in Dauphiné and the Pyrenees is recorded [see also this *Review*, Ser. B, vii, p. 29].

LABBÉ (M.), THARGETTA & AMEUILLE. **Le Kala-azar infantile en France.**—*Rev. Scient., Paris*, lvii, no. 3, 1st–8th February 1919, pp. 84–85.

Infantile kala-azar exists in France, at any rate on the Mediterranean coast adjoining the Italian frontier. It is supposed that the two children at Nice whose cases are here cited contracted the disease from infected dogs, canine leishmaniasis being known to occur on the Mediterranean coast from Marseilles to the Italian frontier.

HADWEN (S.). **Parasitic Diseases.**—*Jl. American Vet. Med. Assoc., Ithaca, N.Y.*, liv, no. 6, February 1919, pp. 639–642, 3 figs.

The author is of opinion that certain ticks, especially *Dermacentor albipictus* and possibly *D. venustus*, play an important part in the diseases known as fistulous withers and poll evil that occur among unbroken range horses on the western slopes of the Rocky Mountains. The chief points of infestation are along the whole length of the mane, from the poll to the withers. At each point of attachment there is a necrotic spot after the tick has been attached for a few days and these are probably a favourable point of entrance for bacteria. The bite of *D. venustus* causes the animal to bite, scratch and rub the affected parts thus further encouraging the introduction of bacteria. As these ticks attach themselves by preference to the base of the mane it should be a simple matter to treat them with one of the usual oily dressings, such as a mixture of 4 gals. train or seal oil, ½ gal. tar, and 1 lb. oil of turpentine, which should be well rubbed in after shearing.

SCHWETZ (J.). **Quelques Remarques concernant les Moeurs de la *Glossina tabaniformis*, Westw.**—*Ann. Trop. Med. Parasit., Liverpool*, xii, no. 3–4, 28th February 1919, pp. 279–280.

Glossina tabaniformis, Westw., is one of the rarest species of *Glossina* and one that has received little attention, the few individuals that are known having come from Western Africa. The species has been found at Léopoldville, in the Belgian Congo, and the author now records it from the province of Katanga. Four days' inspection of the locality produced three individuals, together with a number of *G. palpalis*. The first fly was taken on a tree-trunk after sunrise, and another was taken in the same position the next day at sunset. No pupae could be found in the vicinity.

SCHWETZ (J.). **Quelques Observations Préliminaires sur les Moeurs de la *Pangonia zonata*, Walk.**—*Ann. Trop. Med. Parasit., Liverpool*, xii, no. 3–4, 28th February 1919, pp. 281–288.

While Tabanids such as *Haematopota*, *Tabanus* and *Chrysops* are fairly abundant in the Belgian Congo, especially near water, flies of the genus *Pangonia* are rarely seen in North Katanga. In certain localities, however, they are abundant from the end of April until early July, that is, during the blossoming of a plant, a species of *Blepharis*, from which they extract the nectar. *Pangonia zonata*, Wlk., is the most numerous species, and both this and an unidentified species of the same genus attack man, the bite being particularly deep and painful, although they do not appear eager to attack human beings and seem to be easily disturbed when biting. They are noticeable from early morning until about 11 a.m. and disappear almost completely from noon until about 3 p.m.

CARTER (H. F.). **New West African Ceratopogoninae.**—*Ann. Trop. Med. Parasit., Liverpool*, xii, no. 3 & 4, 28th February 1919, pp. 289–300, 1 plate, 4 figs.

The small Chironomid flies forming the sub-family CERATOPOGONINAE are of considerable economic interest, as a number of species

are known to suck blood. The author describes *Forcipomyia ingrami*, sp. n., the larvae of which were found and reared at Accra. While studying larvae of *Stegomyia fasciata*, Dr. Ingram found that these were being eaten by larvae of *F. ingrami* which were generally found not swimming actively, but wandering just above the water-line, being not strictly aquatic. The pupae observed were very inert and were generally found just above the water-line; when submerged they became detached and showed feeble movements in the water. The eggs have not been found. The larval stage apparently depends upon the amount of the food-supply; the pupal stage lasts about 36 hours. The larvae of this species prey upon mosquito larvae breeding in holes in trees, where several species of *Stegomyia*, including *S. fasciata*, the carrier of yellow fever, frequently occur. The chief food of the larvae of *F. ingrami* is probably the organic débris found on the surface and sides of the rot-hole and this frequently includes dead and stranded larvae and pupae; probably healthy pupae and emerging adults also are eaten. The food of the adult has not been definitely ascertained, but is probably similar to that of the larva, as records of these midges attacking other insects are accumulating.

Culicoides ochrothorax, sp. n., is also described from the Gold Coast, some members of this genus also being known to suck the body-fluid of living mosquitos.

Cleland (J. B.). **Researches on Plague.**—*Report of the Director-General of Public H alth, New South Wales, for the Year ended 31st December 1916, Sydney*, 1918, pp. 174–175. [Received 7th March 1919.]

In connection with routine measures taken for the detection of the presence of plague and the prevention of its spread, 7,943 rats and mice were examined during 1916. Plague was not found in any of the specimens. The last plague-infected rat was found in Sydney in April 1910. The fleas collected were:—*Xenopsylla* (*Loemopsylla*) *cheopis*, *Ctenopsylla musculi*, *Ceratophyllus fasciatus*, and *Ctenocephalus felis* (or *canis*).

Cooley (R. A.). **Third Biennial Report of the Montana State Board of Entomology, 1917-1918.**—*Helena*, 15th December 1918, pp. 5–25. [Received 7th March 1919.]

The work of eradication of the spotted fever tick [*Dermacentor venustus*] has continued for six years and is still being carried out on the same lines as in previous years [see this *Review*, Ser. B, iii, p. 60, and v, pp. 78–80]. The more important results so far obtained are a reduction both in the cases of spotted fever and in the number of ticks, the better information of the residents regarding the real cause of the disease and ways of avoiding it, and their greater confidence in the future of their land, together with less fear of the disease. Statistics show that the cases in Bitter Root Valley have steadily declined from 11 in 1913 to 3 in 1918. In some localities the results of eradication methods have been much better than in others, largely owing to more effective co-operation of the residents. The grazing of animals on unfenced areas has been the cause of a large increase in the tick

population. Grazing on a commercial scale is being carried on in some cases and in others animals are allowed at large and receive practically no attention to free them from ticks. Dipping is hardly practicable, as they cannot be collected sufficiently frequently. Further legislation is required to keep the animals off the tick-infested area during the tick season. Commercial grazing along the county roads and in unfenced fields should be prohibited in localities where ticks are present. It is estimated that the expenses of the eradication work during the next two years will be approximately £1,700.

PARKER (R. R.). **Report of Tick Control Operations in the Bitter Root Valley during the Season of 1918; Facts in Connection therewith; Recommendations for the further Prosecution of the Work.**—*3rd Bienn. Rept. Montana State Bd. Entom., 1917–1918*; *Helena*, 15th December 1918, pp. 25–40. [Received 7th March 1919.]

The eradication measures against *Dermacentor venustus* in Bitter Root Valley in 1918 may be summarised as squirrel killing, dipping, grazing, enforcement of quarantine and educational work. The poison used for ground squirrels during the spring consisted of 5 U.S. bushels groats, 8 oz. baking soda, 20 oz. strychnine alkaloid, 5 U.S. pints salt, 12 U.S. quarts water, 5 lb. gloss starch, $1\frac{1}{4}$ oz. saccharine, 1 U.S. quart syrup. This proved very successful but expensive, and later, excellent results were obtained from 8 U.S. quarts crushed oats, 1 oz. sodium bicarbonate, 1 teaspoonful saccharine, 1 oz. strychnine, 1–2 lb. starch and 3–4 U.S. quarts water. The greatest drawback to success in this work is the land owned by non-residents, which is mostly unoccupied and largely unfenced; such land receives no attention as regards squirrel destruction and comprises the most dangerous tick areas. While early spring is the most important time for poisoning, there is great advantage in distributing poison occasionally as long as ground squirrels are about. With regard to dipping, it was considered advisable to discontinue compulsory dipping, and this was done, not because the practice was considered unreliable in tick eradication, but because of its incompatibility with certain existing conditions. Wherever dipping was possible, vats were filled and the solution tested and kept at proper strength by the State, assistance for dipping being furnished as far as possible, while the residents were responsible for getting their animals to and from the vats.

An attempt was made to get as many grazing animals as possible out of the tick-infested areas during the season of adult tick activity, from early spring to the beginning of July. When milk cows and working horses graze within fenced areas the animals should be freed from ticks by hand at frequent intervals and the land thoroughly poisoned for ground squirrels once each season. The grazing of animals on unfenced land lying between the farms and mountains is a dangerous practice, and grazing should be restricted until such land has been cleared up by systematic squirrel destruction. Roadside grazing should be prohibited or controlled. The placing of all animals possible on the forest ranges during the season of adult tick activity is considered most desirable. Quarantine regulations have been enforced as far as possible. Burning, which is regarded by many farmers as a valuable remedy for ticks, cannot be considered as anything more

than an accessory control measure, its indirect value through cleaning and clearing the land being probably greater than its value in the destruction of ticks.

Every effort is being made to increase the knowledge of the residents, whose ignorance on these matters is often surprising, and it is intended to publish and distribute among them a brief bulletin on tick control.

It is not at present considered necessary to attempt the extermination of mammalian hosts of the tick other than the Columbian ground squirrel [*Citellus columbianus*], though in the future such a course may be found necessary in certain cases, such as the mountain goats from the vicinity of the tick districts.

PARKER (R. R.). **Second Report on Investigations of the Rocky Mountain Spotted Fever Tick in Eastern Montana.**—*3rd Bienn. Rept. Montana State Bd. Entom., 1917–1918; Helena,* 15th December 1918, pp. 41–54. [Received 7th March 1919.]

The investigations into the habits and host-relationships of the Rocky Mountain spotted fever tick [*Dermacentor venustus*] which were begun in 1916 [see this *Review*, Ser. B, v, p. 80] were continued in 1917 in eastern Montana. The character of the country was found to have a fundamental influence on the abundance of the tick, the hilly, rocky country of this part of the State serving as an admirable habitation for the small host-animals of the larval and nymphal ticks. A table shows the results of examination of wild mammals for larvae and nymphs of the tick. Of these, the jack rabbit is the most important, being a host of all stages of the tick and being susceptible to the disease; next in importance is the deer mouse. A correlation is noticeable between the abundance of ticks and that of rabbits preceding or accompanying occurrences of the fever, *e.g.*, the unusual prevalence of the disease in northern California in 1915 and 1916 was preceded by great rabbit abundance in 1914 and 1915. In eastern Montana the disease in 1915, 1916 and 1917 moved steadily westward while the height of rabbit abundance preceded or seemed to be coincident with it. It is believed that cottontail rabbits are more important tick hosts than the results of examination show. Examination of wild mammals for adult ticks showed 100 per cent. of infestation for porcupines, 71 per cent. for jack rabbits and 11 per cent. for cottontail rabbits. Among domestic animals, the horse is the most efficient host of adult ticks. While in one locality very few ticks were found on cattle, in another they proved to be important hosts. Pigs may sometimes carry a considerable number of ticks; observations on sheep have not been made to any extent, but evidence indicates that they may suffer heavy infestation.

In most regions of eastern Montana, ticks are unusually abundant only during occasional seasons or possibly in some places during two successive seasons, with an interval of several years between the periods of abundance. In the area recently examined adult ticks appeared early in April and were abundant during May and the first half of June, after which they declined rapidly, though considerable numbers were found even in August. Larval ticks were first collected on 21st May and nymphs on 5th April. Both were still abundant on 25th August. Seed ticks and nymphs were both numerous in June, the former being most abundant later in the season.

A comparison of tick conditions in the two regions studied illustrates the great diversity of the problems to be faced in the work of eradication. Points that it is particularly desirable to investigate are the factors governing the periodical abundance of ticks, the relation of rabbits to the occurrence of the fever, tick conditions in regions where ground squirrels occur, the host-relationships of the tick, and the factors governing the occurrence of the fever in Carbon County, where cases of fever occur almost every year.

WOLBACH (S. B.). **Rocky Mountain Spotted Fever, Pathology and Etiology; Progress.**—*3rd Bienn. Rept. Montana State Bd. Entom., 1917–1918*; *Helena*, 15th December 1918, pp. 55–60. [Received 7th March 1919.]

The results of earlier investigations on the parasite of Rocky Mountain spotted fever have previously been published [see this *Review*, Ser. B, v, p. 80]. The further study of the disease in both man and animals has clearly proved it to be a specific infectious endangitis of the peripheral blood-vessels; the disease being exactly duplicated in man and animals.

The parasite as found in sections of ticks exhibits the following forms: (1) a lanceolate paired form similar to those seen in mammals; (2) a smaller, more slender rod-shaped form; (3) a minute, oval coccoid form just within the limits of vision. Only the first of these can be found in ticks that have been kept for several months. In spite of a most extensive series of experiments this parasite has not yet been cultivated, but its relationship to Rocky Mountain spotted fever must be accepted as proved in view of its constant occurrence in the specific lesions in man and laboratory animals and because it has been proved to be inseparable from infective ticks. Efforts were made to determine the duration of infectivity of the tick. Ticks infected as nymphs proved infective after 17 months, which is approximately the maximum life period of an unfed adult. The infectivity of eggs from infected females has been confirmed. Experiments with rabbits indicate that there is no transmission of immunity to the young of immune parents. The behaviour of the virus in rabbits requires further study, as the strain in them could not be maintained indefinitely, there being a gradual decline in infectivity with repeated passage. It does not seem probable, in the light of recent experiments, that a highly potent immune serum can be obtained from the smaller laboratory animals.

GROS (H.). **A propos d'*Anopheles chaudoyei*.**—*Bull. Soc. Path. Exot., Paris*, xii, no. 2, 12th February 1919, pp. 53–54.

It is pointed out that recent notes on *Anopheles chaudoyei* [see this *Review*, Ser. B, vi, pp. 141, 201] suggest that this species is peculiar to the oases of Algeria and Tunisia. The author in 1904 recorded the existence in the valley of the Sebaou of three species of *Anopheles*, one of which was *A. chaudoyei*, and it is probable that this species occurs over a wide area in Algeria and Tunisia and is not confined to the Sahara.

RODHAIN (J.). **Sensibilité du Rongeur africain** *Tachyorectes annectens*, **Th., au** *Trypanosoma pecaudi*.—*Bull. Soc. Path. Exot., Paris*, xii, no. 2, 12th February 1919, pp. 84–86.

During the early part of 1916 there was a heavy mortality among pack-animals, mules and donkeys, accompanying the Belgian troops encamped north of Lake Kivu. These animals came mostly from the Egyptian Sudan, travelling by way of Uganda. Examination of their blood showed that death was due to an infection caused by a dimorphous trypanosome of the type, *Trypanosoma pecaudi*. This parasite was proved to be virulent to the grey rat of the country, to dogs and to a burrowing rodent, *Tachyorectes annectens*, which was abundant in the upland prairies near the lake.

SERGENT (Edm. & Et.) & LHÉRITIER (A). **Dromadaires immunisés contre la Trypanosomiase "Debab."** [Camels rendered immune to "Debab" Trypanosomiasis.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 2, 12th February 1919, pp. 86–90.

Two cases are recorded of immunity in camels to *Trypanosoma berberum*. The experiments are given in detail and showed, in the first case, an acquired immunity following an infection inoculated in the laboratory, later inoculations being given to maintain and strengthen the immunity, and in the second case a natural immunity. In both cases the animals became infected but showed no sign of illness, having therefore what is termed relative immunity. It is considered that this relative immunity may be due to the persistence of a slight infection; but this infection must have been very slight, since inoculation into dogs of large quantities of blood from the animal produced no infection. Such animals, however, constitute persistent reservoirs of the virus, although, trypanosomes being very rare in the blood, flies do not readily become infected in biting them.

SERGENT (Edm.) & LHÉRITIER (A.). **Gale du Dromedaire (première note).** [Mange of Camels (1st Note).]—*Bull. Soc. Path. Exot., Paris*, xii, no. 2, 12th February 1919, pp. 94–99, 5 figs.

Mange is the disease second in importance among camels of northern Africa, debab being the worst. The Sarcoptid mite producing the disease, *Sarcoptes scabiei* var. *cameli*, is described. An account is given of the course of the disease among a troop of fifteen individuals which were sent to the Algerian coast in the spring. They were in a poor state of health, and most of them showed some traces of mange. Although the animals were not worked and were well fed, after some weeks in which the disease remained in abeyance mange suddenly attacked the whole body of all the animals, causing death in two or three months. The treatment with washes that has been given to horses with much success proved very harmful to camels, which are extremely sensitive to moisture. The best treatment as yet known is the application of the preparation of tar made by the natives with *Juniperus phoenicea* and *Thuja articulata*; this; applied promptly, thoroughly and repeatedly, has given much success.

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Every person obliged to touch the camels in the course of the treatment became infected with mange within three weeks, the disease being cured in the case of young, healthy and careful individuals in two or three weeks, but proving very obstinate in the case of old or unhealthy persons in frequent contact with the animals, and the latter were only cured after treatment for several months.

VELU (H.). **Existence au Maroc d'une nouvelle Espèce d'*Ornithodorus*.** [The Occurrence in Morocco of a new Species of *Ornithodorus*.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 2, 12th February 1919, pp. 99–104, 9 figs.

Ornithodorus marocanus, sp. n., is described from individuals found in the crevices of walls, whence they issued at night to bite pigs, causing severe ecchymosis. This species is quite distinct from *O. erraticus*, found in various localities of northern Africa, and is more nearly allied to *O. turicata*, from which, however, it is distinguished by the character of the tarsi and by the absence of any smooth parts on the body, which is entirely granulated. It attacks both man and pigs, the bite being painful and causing an ecchymosis that lasts 4 or 5 days and is sometimes accompanied by a slight fever.

RODHAIN (J.). **Larves de Sarcophagides probablement Parasites accidentels de *Glossina palpalis* en Captivité.** [Larvae of Sarcophagids probably accidental Parasites of *Glossina palpalis* in Captivity.] — *Bull. Soc. Path. Exot., Paris*, xii, no. 2, 12th February 1919, pp. 104–106.

The author records finding in the Upper Congo region an individual of *Glossina palpalis*, which had been enclosed in a bottle for five days with many others, full of Sarcophagid larvae, 50 being extracted from the abdomen of the one fly. In the opinion of Dr. Keilin to whom the larvae were sent for examination it is considered possible that the Sarcophagid may have parasitised the *Glossina* in flight, as *Sarcophaga kellyi* has been known to attack a flying grasshopper. In view, however, of the number of larvae found within the one fly this hypothesis is not considered probable and it is thought far more likely that the larvae issued from a female Sarcophagid enclosed in the bottle and were attracted to the decomposing body of the tsetse-fly which had been gorged with blood.

RODHAIN (J.). **Note sur deux Choeromyies de l'Afrique orientale.** [A Note on two Species of *Choeromyia* in Eastern Africa.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 2, 12th February 1919, pp. 106–107.

As the only species of *Auchmeromyia* known to occur in ex-German East Africa was *A. luteola*, which is uniformly distributed there, the author determined to investigate the existence of *Choeromyia*, the larvae of which parasitise *Orycteropus* and *Phacochoerus*. The haunts of these mammals were searched, with the result that two of the four known species were captured, namely, *C. bequaerti* and *C. praegrandis*. The localities in which these flies were captured are described and indicate that both species are widely distributed throughout inter-tropical East Africa.

KITASHIMA (T.) & MIYAJIMA (M.). **Studien über die Tsutsugamushi Krankheit.** [Studies on the Tsutsugamushi Disease.]—*Kitasato Archives Exptl. Med., Tokyo*, ii, no. 3, December 1918, pp. 237–334, 2 figs, 9 plates. [Received 17th March 1919.]

This paper, which is a continuation of a previous one [see this *Review*, Ser. B, vii, p. 44], deals chiefly with the virus of tsutsugamushi or Japanese river fever. This is carried by field mice, which also harbour the transmitter of the virus, a Trombidiid mite very similar to the European *Leptus autumnalis*. The description given of the development and life-history of the mite supplements a previous account by Miyajima and Okumura [see this *Review*, Ser. B, vi, p. 21]. The authors disagree with Tanaka [*loc. cit.*, p. 50] and consider the mite infesting man to be identical with that found in the ears of field mice. A louse, *Haematopinus spinulosus*, and a Haemogamasid mite, *Laelaps echidninus*, also infest the mice, and the adults of *Laelaps* have sometimes been mistaken for those of the akamushi mite. The reports of various observers show that the akamushi mite has a wide distribution, at least in Eastern Asia, and occurs in fever-free areas as well as in infected ones. Infestation of mice by the mite is most marked in July, August and September, while in December and January such infestation may be held to be non-existent. Larvae taken from a mouse became adult in 10 weeks, and the larva requires about 3 weeks in September to hatch from the egg. It may therefore be assumed that the whole development requires about 3 months in the warm season. A comparison of the larval and adult stages of this mite and allied species leads to the supposition that the akamushi mite is a species of the genus *Trombicula*, Berlese, and nearly identical with *T. coarctata*; and furthermore that *Leptus autumnalis*, Shaw, is the larva of an as yet undetermined species of *Trombicula*, contrary to the views of European workers who consider that the akamushi mite and *L. autumnalis* belong to the genera *Trombidium* or *Microtrombidium*.

GRAY (D. T.). **Report of the Animal Industry Division.**—*40th Ann. Rept. North Carolina Agric. Expt. Sta. for Year ended 30th June 1917* [*Raleigh*] [n. d.], pp. 33–63. [Received 18th March 1919.]

Mites on poultry can be controlled by the use of sulphur in solution or by a nicotine solution free from the stems and leaves, lime, sulphur or tobacco leaves in a dry state being useless. To prepare nicotine solution for this purpose 2½ lb. of stems and leaves should be put in sufficient water to cover them, boiled for one hour, the liquid drained off and boiled down to ¼ U.S. pint, which is then mixed with 4 oz. water in which has been placed one tablespoonful of nicotine with one quart measure of plaster of Paris. This should be stirred and passed through a fly-screen sieve, when it is ready for use.

METZ (C. W.). **Some Aspects of Malaria Control through Mosquito Eradication.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 5, 31st January 1919, pp. 167–183, 4 figs.

The institution of malaria-control operations as the accompaniment of recent military activities has resulted in the introduction of numerous

innovations, ingenious methods, more efficient tools, etc., to meet the requirements of the sudden exigency, to the great benefit of the operations as a whole. The general principles of mosquito control consist primarily of drainage, where the water can be disposed of, and oiling, where it must remain; both methods are aimed at the Anopheline larvae, little, if any, attempt having been made to deal with the adult mosquitos.

The three mosquitos to be considered as vectors of malaria in North America are:—*Anopheles quadrimaculatus*, *A. punctipennis*, and *A. crucians*, the first of which is undoubtedly the most important, since it enters houses to feed more readily than will either of the other species. Whether it actually prefers human blood to that of domestic animals is uncertain, whereas the other two species exhibit a definite preference for the latter. It breeds in natural waters in preference to artificial containers, mainly in ponds, swamps, puddles, lakes, etc., and is very seldom found in running water, while a small amount of sewage or of chemical or other contamination will effectually prevent breeding. *A. punctipennis* should rank first in point of numbers and general distribution. Its breeding places are the same as those of *A. quadrimaculatus*, with, in addition, streams or ditches of slowly running water, and it also seems to be able to stand more contamination than *A. quadrimaculatus*. Although it is known to transmit malaria under laboratory conditions, the impression exists that in nature it is relatively unimportant as a vector of malaria. The final determination of this point would effect the saving of an immense amount of money now being spent, perhaps needlessly, on the eradication of this species. *A. crucians* is generally less common than the other two, and is found in the most restricted localities, often in brackish waters, or waters contaminated with chemicals, where, in suitable places, it may be extremely abundant. Its importance as a vector of malaria is a relatively unknown quantity, for though it is known to harbour at least one of the malaria parasites, it shows a preference for the company of domestic animals rather than that of man.

The most reliable and most permanent control is effected by drainage, which includes the cleaning of ditch banks and the removal of débris. Temporary puddles can probably be best dealt with by oiling, and roadside ditches can usually be ditched without much difficulty. Borrow-pits may either be drained or oiled according to their depth, and old wells, cisterns and the like may be filled or oiled or treated with chemicals, attempted drainage being seldom advisable. Real drainage problems arise in the matter of ponds, lakes and swamps, and these must be dealt with according to the sources of water. Rain-water ponds and swamps can be drained by the provision of one or two ditches to carry off the surplus water left after the main flood waters have passed. A pond or swamp that is simply a basin in the channel of a sluggish stream is more difficult to deal with, since the water supply is continuous and fluctuating; but it may be drained by channelling the stream below the swamp to lower the water and increase the flow, or it may perhaps be more effectively dealt with by a combination of clearing and oiling. Swamps formed by seepage outcrops can be dealt with only by aiming at the water table below the surface. The only way of collecting such water issuing along a hillside is by means of ditches dug at right angles to the flow of the

seepage water, that is, across the exposed end of the water table. Such ditches may then be connected to one or more main ditches, if necessary, and the water carried down the hillside parallel to the seepage flow. Other recommendations to be noticed in drainage work are the construction of V-shaped instead of flat-bottomed ditches and the cutting of a V-shaped ditch about the width of a shovel down the middle of a large ditch made to carry flood waters, to prevent the formation of a series of shallow puddles in the dry season. Vertical drainage, which is effected by means of wells sunk vertically for the purpose of conducting water down through relatively impervious soil into water-bearing sand or gravel, is usually advisable only where surface drainage is very difficult or expensive.

In oiling, no definite formula can be given for the oil to be used. Straight kerosene is very effective, for it spreads rapidly and makes a very thin film, but it also evaporates rapidly and is difficult to see on the water, hence it is usually mixed with so-called crude oil in parts varying from 3 : 1 to 1 : 3. The most satisfactory mixture is one that is nearly black in colour and slightly thicker than kerosene in consistency. In ordinary work the oil is generally applied by the knapsack spray-can, which is furnished with an adjustable nozzle capable of throwing a very fine spray. Drip-cans may be used with advantage on small streams and ditches with a fairly good current. A useful type of can may be made from an ordinary 5 or 10 gal. oil-can having a spout near the top. The screw cap of this spout is perforated, and a nail, packed round the basal end with waste, is inserted in the hole and the can is laid on its side with the spout downwards. The oil drips out along the nail and by tightening or loosening the latter the flow can be regulated down to a few drops a minute.

Oil-soaked waste or bags of oil-soaked sawdust are often used as a substitute for drip cans [see this *Review*, Ser. B, vii, p. 75], and a new method of laying down oil by capillarity has recently been proposed [*loc. cit.*, p. 76]. This system enables constant oiling to be maintained whatever the direction of the wind, and is the method preferred for permanent ground pools and drainage ditches, while it also enables the labourers to devote most of their time to preventing obstructions, particularly algae, which would interfere with the spread of the oil. This method also effects substantial economy in the cost of labour, oil and apparatus.

Accessory measures are fish control and the use of larvicides, the latter not being used at the present time to any great extent, except where they constitute the waste products of chemical factories. Nitre cake, which is the only one in anything like general use, is fairly efficient, but of limited utility, being suitable only for old wells and abandoned cisterns where there is no danger of poisoning persons or domestic animals.

Experiments are being conducted with a combination oil larvicide in the form of creosote oils ; this is more lethal than kerosene and may be effective without forming a complete film. So-called "refined creosote" or commercial creosote, of a dark colour and a consistency rather greater than that of kerosene, is applied in the form of a fine mist-spray from a small hand-pump of ½ gal. capacity and of the automatic type used for spraying disinfectants in a constant atomised mist-spray. Such a mist will settle over the surface of the

water, into hoof-prints, etc., and will float in among plants or other obstructions on the surface, provided they do not form a complete canopy. A remarkably small quantity of this material will kill Anopheline larvae if properly applied, and since it costs from about 10 pence to 15 pence per gallon in bulk, and 1 gal. will do the work of several gallons of oil, its use would effect a substantial economy. As creosote is poisonous to fish and other animals, it must be used with caution on water containing fish, or used by stock.

Useful equipment and supplies include dynamite for removing stumps from ditch lines, etc., horse-and mule-drawn ditching machines for making V-shaped ditches of less than 3-ft. depth in open land, and phosphate drags, tools somewhat resembling a potato fork but more substantial, which are invaluable for cleaning out ditches or for working in marshy land that is full of obstructions such as roots.

SAUNDERS (P. T.). **Douchage pour la Destruction des Tiques à Antigues.** [Dipping for the Destruction of Ticks at Antigua.]—*Sta. Agron. Guadeloupe, Pointe-à-Pitre, Antilles Françaises*, Bull. no. 1, 1919, pp. 31–35.

Ticks have been for some years a serious drawback to the raising of cattle in the French Antilles, very little having been done in many of the Islands to combat them. The usual method has been to remove the ticks by hand or with a knife, after which the infested parts are rubbed with a weak solution of disinfectant liquid. This method has left much to be desired ; it cannot be thorough in practice, while in the case of *Amblyomma variegatum* the mouth-parts of the ticks remain in the skin of the host when the tick is removed and frequently cause a poisoned wound. The establishment of a dipping apparatus has resulted, after 12 months' use, in a great improvement in the condition of the cattle, and it is suggested that horses and mules might with advantage be treated in the same way. Particulars are given of one of the standard types of dipping apparatus.

HEADLEE (T. J.). **Practical Application of the Methods recently discovered for the Control of the Sprinkling Sewage Filter Fly (*Psychoda alternata*).**—*Jl. Econ. Entom., Concord, N.H.*, xii, no. 1, February 1919, pp. 35–41, 2 plates, 4 figs.

An account of the fly, *Psychoda alternata*, occurring in sprinkling sewage filters, and the discovery of the possibility of controlling it by submerging the larvae and pupae in water for 24 hours, has recently been noticed [see this *Review*, Ser. B, vii, p. 24]. It is not known whether the flies are actual carriers of disease, but as they fly, or are wind-borne, into houses at a distance of ¾ mile from the sewage filters, and there penetrate the finest screens and fall into food that is to be eaten by human beings, the probability is that infection is brought by them. The first experimental submergence having resulted in the destruction of 100 per cent. of the larvae and pupae, a large sewage disposal plant was fitted with a bulkhead pierced with a passage ay that could be opened or closed, one bulkhead being installed in

each of the two galleries through which the effluent escaped from the filter bed. The retaining walls in this case were of six-inch concrete backed by soil, the normal volume of sewage ranged from 2½ to 4 million gallons daily and the time during which the filter could be submerged without seriously injuring the activity of the film was found to be up to 36 hours. Water drawn off after a submergence of 24 hours was full of dead larvae of *P. alternata*. Since the life-cycle of the fly during the summer occupies barely two weeks, the filter should be submerged once every 10 days until the flies are killed out, especially as it is not definitely known whether the egg is able to resist the submergence. In the coming season submergence will be begun in the spring, before the flies emerge, and will be continued at 10-days' intervals until rendered unnecessary. The chief factor limiting the application of this method is the fact that many beds have been constructed without retaining walls. In such cases the author recommends the construction of wooden walls backed by an earthen fill, or the construction of concrete retaining walls such that the bed can be filled in 12 hours and submergence maintained for 24 hours.

PIERCE (W. D.). **Some New Phases of the Entomology of Disease, Hygiene and Sanitation brought about by the Great War.**—*Jl. Econ. Entom., Concord, N.H.*, xii, no. 1, February 1919, pp. 42–49.

The growth of medical entomology during and in consequence of the War is reviewed and some of the outstanding features of its development are discussed. The necessity for co-operation between entomologists, doctors and parasitologists is insisted upon. Some of the most notable discoveries in medical entomology are enumerated and in particular the modern methods of control of lice, mosquitos and flies and the growth of sanitary entomology. It is pointed out that in the past considerably larger sums have been spent in dealing with the pests of agricultural crops than in the control of insects affecting the health of man and animals. The author hopes that this branch of the science has received a new impetus, that a great field for research and practical work will be opened up and that in time no medical school will be without a complete course in the entomology of disease, hygiene and sanitation. A new phase in sanitary entomology has been opened up in its application to industry, since the discovery that lowering the specific gravity of the oil used in dry cleaning establishments has an important bearing on the destruction of insects, especially lice.

MOHLER (J. R.). **Report of the Chief of the Bureau of Animal Industry.**—*U.S. Dept. Agric., Washington, D.C.*, 28th September 1918, 63 pp. [Received 24th March 1919.]

During the fiscal year ended 30th June 1918, the Field Inspection Division supervised the dipping of over five and a half million sheep for the purpose of eradicating sheep scabies. The eradication of the disease in Montana and Nevada was practically completed, 1,367 square miles in Louisiana were placed under quarantine on account

of it, and 239,484 square miles in Texas were released from such quarantine. During a similar campaign against cattle scabies 642,831 cattle were dipped and a few scattered outbreaks in several States were quickly brought under control. The remaining area under Federal quarantine, 3,817 square miles in Texas, was released. Horses and mules to the number of 545 were dipped for scabies under Bureau supervision.

The Tick Eradication Division made greater progress than in any previous year in the work of exterminating the ticks which transmit Texas fever to cattle. Areas that aggregated 67,308 square miles, having been freed of ticks, were released from quarantine. Inspections or dippings to the number of 34,927,959 were made of cattle, as against 24,390,721 in the preceding year. There were in operation 26,470 cattle-dipping vats where cattle were dipped under Federal State supervision. The work accomplished in tick eradication in the last year makes available 86 counties and 37 parts of counties into which better-bred cattle from tick-free States may be taken without danger of loss from tick fever. A consequent increase in meat and dairy products may be expected, and in addition the hides of all cattle will be improved to a degree which will render them 20–50 per cent. more valuable.

During the autumn of 1917 and the spring of 1918 much attention was given to the possibility of the conveyance of hog cholera by insects, lice, flies, mosquitos and other insects being studied, and much valuable information obtained. In some cases cholera has been transmitted by means of flies, but it is too early to express a definite conclusion on the relation of insects to the spread of this disease.

In the Zoological Department the investigation of parasitic diseases of animals and the study, collection and determination of animal parasites have been continued. Experiments showed that it was impossible to protect cattle from infestation with ox warbles [*Hypoderma bovis*] by dipping or spraying with various remedies. Cattle lice were found to be effectively eradicated by means of coal-tar creosote dips when reasonably good water was used. The best treatment for the louse infesting pigs [*Haematopinus suis*] was shown by several series of experiments to be dipping. Wallows, medicated with coal-tar creosote-dips, pine-tar, crude petroleum or bland oils, and rubbing posts treated with crude petroleum, reduced the number of parasites to such an extent that they caused little or no damage, though neither of these methods resulted in complete eradication. The best results were obtained with a $\frac{1}{2}$ of 1 per cent. solution of pine-tar in the wallows. Crude petroleum and coal-tar creosote dips proved to be more effective when applied from an ordinary sprinkling can than when used in wallows or on rubbing posts. Mange in pigs was studied experimentally by different methods of treatment, but the work has not progressed sufficiently to warrant definite conclusions. The treatment of large numbers of cattle with various preparations for ear ticks [*Ornithodorus megnini*] showed that there was no better remedy than pine-tar 2 parts, and cotton-seed oil 1 part. Special attention was given to sarcoptic mange of cattle, the results of experiments showing that sarcoptic scabies [*Sarcoptes scabiei* var. *bovis*] can be eradicated by 4 dippings in lime-sulphur or nicotine, the interval between dippings being from 6 to 10 days.

Imes (M.). **The Spinose Ear Tick and Methods of Treating Infested Animals.**—*U.S. Dept. Agric., Washington, D.C.*, Farmers' Bull. 980, May 1918, 8 pp., 4 figs. [Received 24th March 1919.]

Ornithodorus megnini (spinose ear tick) is a parasite especially prevalent in the semi-arid sections of the south-western United States, where it has become a very important pest. The removal of live-stock from the infested area causes the tick to become widely disseminated, but as moisture is apparently detrimental to it during certain stages in its life-cycle, it does not become established to the same extent in other parts of the United States. It is most frequently found in the ears of cattle, horses, dogs and sheep, and in infested areas wild animals, especially jack rabbits, are often severely attacked.

The ticks enter the ears of the animal as small seed-ticks or larvae, not easily visible to the naked eye, and attach themselves to the tender skin below the hair line. They begin at once to suck blood and in a week or two are fully engorged and shed their larval skin. The nymphs also attach themselves to the skin lining the ear, where, unless destroyed or accidentally dislodged they remain for from 1 to 7 months until fully grown and completely engorged. They then fall from the animal and usually crawl upwards several feet from the ground, secreting themselves in dry protected places such as cracks and crevices in buildings, fences and trees, where transformation into the adult, mating and oviposition take place. So far as known, the adult never attaches itself to animals nor does it take food, though females which do not find a mate have been known to live more than a year. Oviposition may be intermittent and continue over a period as long as 6 months, the death of the female taking place on its completion. The eggs may hatch as early as 10 days after they are laid and the larvae are shortly ready to attach themselves to any suitable animal with which they come in contact, though they have been known to live nearly 3 months without doing so.

The most effective remedy is a mixture of pine-tar and cotton-seed oil, 2–3 teaspoonfuls of which should be squirted into the ear with a metal or hard rubber syringe of 2–4 oz. capacity. The ear should be held upright for a few seconds to allow the fluid to settle into the ear canal, and if the ticks are packed in closely and deeply, a probe made of a piece of stiff wire 6–7 ins. long and with a closed loop $\frac{1}{2}$ inch long and $\frac{1}{4}$ inch wide at one end should be inserted to loosen the mass and more oil should be applied. This simple and inexpensive preparation consists of 2 parts by volume of ordinary commercial pine tar (Stockholm tar or Barbados tar) and 1 part by volume of cotton-seed oil, which is added to it and stirred until a smooth fluid is obtained. Cotton-seed oil is a fairly good solvent for ear wax and therefore penetrates well. It kills ticks and being of a sticky consistency protects the animals from re-infestation for about 30 days. Kerosene oil, gasoline, various dips and disinfectants, and coal tar, unless well diluted with oil, are liable to injure the delicate inner skin of the ear and set up irritation. If too much of the mixture is injected into the ear it will wet the side of the head and blister on exposure to the sun's rays.

Unbroken horses and wild cattle are best handled in a chute, in which, if closely packed, they will hold themselves without additional

restraint so that with a man working on each side of the chute 40–60 animals can be treated in both ears per hour.

If ticks are present on a property, it is advisable to treat all animals periodically, whether they show infestation or not.

MOHLER (J. R.). **Tick Eradication Plans for 1919.**—*Jl. American Vet. Med. Assoc., Ithaca, N.Y.*, liv, no. 7, March 1919, pp. 745–748.

The progress of tick eradication in the United States since 1905 is briefly reviewed. It is hoped to make the year 1919 the most successful there has been in this work. The need for unremitting efforts in educating farmers and cattle raisers in the importance of the campaign is insisted upon and it is remarked that those who still oppose tick eradication are learning every day that their attitude results in pecuniary loss to themselves. With the new State-wide compulsory dipping law in Texas, which becomes effective in the last zone of that State in 1922, it is hoped that the Federal quarantine can be entirely lifted from American territory at the end of 1923. The area still under quarantine is 270,036 square miles; of this it is hoped that 90,000 square miles may be cleared during 1919.

BRADFORD (Maj.-Gen. Sir J. R.), BASHFORD (Capt. E. F.) & WILSON (Capt. J. A.). **Preliminary Report on the Presence of a "Filter Passing" Virus in Certain Diseases, with Especial Reference to Trench Fever, Influenza, and Nephritis.**—*Jl. R.A.M.C., London*, xxxii, no. 2, February 1919, pp. 146–149.

The authors record the isolation of the virus of trench fever from the blood of trench fever patients and from infected louse excreta. The culture obtained either from the blood of man, or from louse excreta, when inoculated by scarification into man, produces a mild illness, and the organism can be recovered from the blood by culture during such illness, and also from clean lice fed on the patient during the illness.

HORNBY (Capt. H. E.). **Some Notes on the Use of Tartar Emetic in the Treatment of Domestic Animals affected with African Trypanosomiasis.**—*Vet. Jl., London*, lxxv, no. 3, March 1919, pp. 89–103.

As a result of experiments with various preparations, and a study of previous work in this connection, the conclusion has been reached that on account of its solubility, low toxicity and high trypanocidal action, tartar emetic is probably the most valuable drug available for use on a large scale in the treatment of domestic animals affected with trypanosomiasis. It is inexpensive, and can be administered intramuscularly or intravenously, though the latter method is the better. One gramme every third day is the maximum that can be administered over a long period to even the largest domestic animals; the same amount every fifth day is well tolerated by adult cattle and horses. Administered scientifically it is capable of curing domestic animals infected with certain strains of *Trypanosoma vivax* and *T. congolense*. Resistant strains of these parasites may, however, frequently be

encountered, while in some cases a single injection effects a cure. Like all other known drugs, tartar emetic is useless in the curative treatment of equines infected with *T. brucei*. Its only value in this form of trypanosomiasis is as a palliative when given regularly to animals working under conditions involving exposure to tsetse-flies.

LITTLE (A.). **The Tampan or Poultry Tick.**—*Rhodesia Agric. Jl., Salisbury*, xvi, no. 1, February 1919, pp. 42–44.

The best methods of dealing with *Argas persicus* (poultry tick) in Rhodesia are described. If birds attacked by tick-fever are treated immediately by dipping them in a solution of hot water and 5 per cent. paraffin and soap-suds, or in a solution of 10 per cent. Jeyes' fluid or similar disinfectant in hot water, and then removing them to clean quarters, there is a chance of their recovery.

The attempted cleansing of tick-infested houses when these are made of grass, straw, or similar material is not recommended, it being better to burn them. Fowl-houses made of corrugated iron are best dealt with by placing a quantity of straw inside and setting fire to it so as to make the house as hot as possible. Brick or wooden houses should be first dealt with by using a plumbers' blow-lamp, the flame being directed into all cracks and crevices, which should then be sprayed with a 20 per cent. solution of Jeyes' fluid or similar disinfectant in water as hot as possible, or with a similar solution of paraffin and soap-suds. All coops, nest-boxes, perches, etc., should be immersed for several days in the above solutions or in a dipping tank; all infested trees should be cut down and fences removed, and the ground on which the houses stand should be saturated with paraffin. Other disinfectants that can be used, though more expensive than the above, include:—a 10 per cent. solution of carbolic acid; a 10 per cent. solution of caustic potash or soda, in the use of both of which great care is necessary; and a 20 per cent. solution of lysol.

As preventive measures all birds newly received should be at once dipped, and the routine dipping of all birds at least once a month should be practised.

WATTS (H. R.). **The Hog Louse.**—*Univ. Tennessee Agric. Expt. Sta., Knoxville*, Bull. no. 120, July 1918, 16 pp., 7 figs. [Received 29th March 1919.]

Haematopinus suis, L. (hog louse) is the largest species of louse found affecting domestic animals, the infestation of which takes place only by actual contact and not through infested pens and bedding. The conspicuous white eggs are deposited on the lower half of the body and above the shanks, and are destroyed as easily as the adults by the application of any oil, the two best being crude petroleum and kerosene, the latter of which must be mixed with an equal part of cotton-seed or other oil. The eggs, which are laid to the number of 3 or 4 a day singly on the bases of the hairs, hatch in 13–20 days. Mating takes place when the lice are 10–12 days old and is immediately followed by oviposition. The length of life after reaching maturity is usually 15–20 days, and there are 6–15 generations a year, the usual number being 9–12.

Dust baths are apparently of no economic importance and should not be relied upon either to control or eradicate the lice. Mud wallows, however, exercise a considerable check on the pest.

WINCKEL (C. W. F.). **Report of a Journey for studying Hygienic Conditions in the United States of North America, Panama and Cuba, made by the Order of the Netherlands Minister for Colonial Affairs.**—*Meded. Burgerlijk. Geneesk. Dienst. Nederlandsch Indië, Batavia*, 1919, no. 1, pp. 1–84, 10 plates.

The eradication of yellow fever in Havana and Panama, anti-malaria work at Panama and anti-plague work at New Orleans, are among the subjects here reported on.

VAN BREEMEN (M. L.). **Malaria in Weltevreden and Batavia.**—*Meded. Burgerlijk. Geneesk. Dienst. Nederlandsch-Indië, Batavia*, 1919, no. 2, pp. 1–40, 3 maps.

The data regarding the distribution of malaria at Batavia, compiled by the Sanitary Service in 1918, are here summarised, the increased death rate in July, August and September being attributed to this disease. Attention is drawn to the relation that probably exists between the monthly rainfall and malaria, more favourable conditions for the increase of mosquitos occurring in seasons when the rainfall is poor.

The Anophelines recorded in Batavia are *Anopheles ludlowi*, *A. rossi*, *A. rossi indefinitus*, *A. aconitus*, *A. fuliginosus*, *A. jamesi*, *A. punctulatus*, *A. kochi*, *A. barbirostris*, *A. umbrosus*, *A. sinensis* and *A. sinensis albipes*. Mosquitos captured indoors from September 1917 to April 1918 included 5,676 *A. ludlowi* and 2,922 *A. rossi*, while all the other species were represented by 181 individuals only. It is noteworthy that in the areas where a high spleen index was found, *A. ludlowi* and *A. rossi* were caught indoors. The breeding-places of the former were not found near houses, proving that this species travels considerable distances in search of blood. Of the mosquitos caught indoors 3,813 *A. ludlowi* and 1,606 *A. rossi* were examined, and 51 (1·3 per cent.) of the former and 5 (0·3 per cent.) of the latter were found to be infected. Some of each of the other species were examined, but with a negative result. *A. ludlowi* would therefore appear to be the principal carrier of malaria. *A. aconitus*, which has been stated to be a dangerous vector in the hilly districts of West Java, is apparently of little importance at Batavia. In this district the northern areas abound in fish-ponds which, though a source of food and revenue, must be held responsible for a large amount of malaria. Mosquito breeding-places are abundant in these areas and the spleen-index is high. Breeding-places decrease in number towards the south and finally disappear altogether, but the spleen-index remains high and *A. ludlowi* is abundant indoors. The author considers the endemicity of malaria in this district to be due to an invasion of the southern areas by *A. ludlowi* from the north. In the case of areas with a low spleen-index and few *A. ludlowi*, lying immediately to the south of others with a high spleen-index and abundant *A. ludlowi*, the theory is advanced that the southern area is protected by the mass of inhabitants in the area to the north of it.

Swellengrebel (N. H.), Schüffner (W.) & Swellengrebel de Graaf (J. M. H.). **The Susceptibility of Anophelines to Malarial Infections in the Dutch East Indies.**—*Meded. Burgerlijk. Geneesk. Dienst. Nederl.-Indië, Batavia*, 1919, no. 3, pp. 1–64.

The practical value of the specific distinction of Anophelines is based on the correctness of three premises:—The constancy of the species, the limitation of the power to transmit malaria to some species only, and the necessity for different breeding-grounds in the various species. The second of these points is mainly dealt with here, the results of several series of experiments being shown in tabular form. Other Dutch East Indian mosquitos may be as important carriers of malaria as *Anopheles ludlowi*, but the latter undoubtedly is a most dangerous one, the number of positive results with it in the infectability experiments being the highest obtained for any. Two specimens of *A. ludlowi* that had infected man on the 13th day were dissected 72 hours later and a number of subtertian sporozoites were found in the salivary glands. As they had taken blood twice a day during five days, they probably carried cysts of different ages; but even were this not the case, the protracted production of sporozoites may be explained by the unequal development of cysts of the same age, sporozoites of varying sizes having been found in a specimen of *A. ludlowi* that had fed only once on a carrier. Experiments with malignant tertian parasites were more successful than with those of benign tertian, perhaps because the latter are not so perfectly adapted to development in *A. ludlowi*, or because the blood does not contain so many gametes. Usually there is no reason to doubt the possibility of further development of malarial parasites in the mosquito, if once the oocyst stage has been reached, but in one experiment with *A. sinensis* the malignant parasite was unable to mature. It was not possible to determine whether the growth of the cysts was only inhibited or whether they were continuously produced afresh and died after reaching the stage of small cysts. One specimen of *A. sinensis* that had infected man on the 10th day showed sporozoites in the salivary glands 48 hours later; the same explanation is advanced as for *A. ludlowi*. Negative results were obtained with malignant tertian malaria regarding the infectability of *A. umbrosus*. This disagrees with Barber's findings in Malaya [see this *Review*, Ser. B, vi, p. 125], but tallies with Roper's observations in British North Borneo [see this *Review*, Ser. B, iii, p. 11]. The type of *A. umbrosus* with which the present experiments were performed breeds in salt water near the sea-coast and differs from the inland form in the presence in the larvae of pilose internal clypeal hairs. It is possible that Barber's results were obtained with the inland form, which also sometimes occurs in salt water. Negative results were also obtained with *A. umbrosus* and tertian malaria. The positive results obtained in *A. barbirostris* and *A. kochi* (with benign tertian) and *A. punctulatus* (with malignant tertian) are remarkable, but the figure expressing the percentage of infectability has little value owing to the small numbers examined. The conclusion reached is that these three mosquitos are not such good carriers as *A. ludlowi*. The experiments with quartan parasites were remarkable because of the small percentage of infected *A. ludlowi*, which is hardly larger than that of *A. sinensis*.

This may be due to the unsuitability of the carrier for this *Plasmodium*, or to the fact that mature schizonts (which in quartan malaria before sporulation strikingly resemble gametes) were mistaken for gametes. In a second series of experiments the authors satisfied themselves that at least some of the parasites showed flagellation and the better results achieved may perhaps be due to this fact.

In observations for determining the natural index of infection, *A. ludlowi* proved to be the most important transmitter. *A. rossi* and *A. rossi indefinitus* were slightly infected, the former more than the latter. This agrees with Barber's experiments. *A. sinensis* was seldom infected. The infection of *A. barbirostris* varied; in the first period of observation it was slight, but during the second period higher than in *A. ludlowi*, though too much importance must not be attached to this increase owing to the small number (33) of specimens examined. The negative results with *A. aconitus* contradict Stanton's observations on the natural infections of this species. It was free from infection in villages where *A. sinensis*, *A. barbirostris* and *A. indefinitus* were infected as well as *A. ludlowi*. *A. aconitus* therefore appears to be pernicious in some countries and not in others. Whether Anophelines with a low natural index should be neglected is a question that is not answered In any case the natural index indicates the species against which the first measures should be directed.

Schüffner (W.), Swellengrebel (N. H.), Swellengrebel de Graaf (J. M. H.) & Mochtar (A.). **On the Biology of** *Anopheles* **(*M.*) *ludlowi* in Sumatra.**—*Meded. Burgerlijk. Geneesk. Dienst. Nederl.-Indië, Batavia*, 1919, no. 3, pp. 65–88, 5 plates.

In those districts of the Dutch East Indies where endemic and epidemic malaria have been studied *Anopheles ludlowi* appears to be the principal carrier and to be easily infected with both the malignant and benign tertian forms; nothing definite is yet known regarding the quartan. It is a well-defined species both in the larval and adult stages, the larvae being easily recognised by the length and position of the clypeal hairs. *A. ludlowi* is a house-mosquito. In Java it has been known to fly about 1,100 yards from a dwelling in search of a breeding-place, while in Sumatra flights of half that distance have been definitely ascertained. It would appear that this species may remain in one and the same house more than one night and one day. In inland localities it does not bite out of doors, though on the coast it does so. It is only found in inhabited houses. *A. ludlowi* apparently requires a rest after feeding and is generally found in the morning near its victim. In a bed-room the proportions of *A. ludlowi* to other mosquitos caught was as 1 to 1. In the large front veranda of the same house the figures were 2·5 and 10, these figures indicating the proportions as between the species and as between bed-room and veranda. In a cow shed the figures were 1½ and 3, and 6 and 10 in a buffalo shed. The bite of *A. ludlowi* is less painful than that of Culicines. As it is not easily disturbed when feeding, a painful bite that attracted attention would lead to its destruction. It is very voracious and keeps on sucking after its stomach is filled. At the same time it defecates, first a clear liquid and then the ingested blood, which may possibly have undergone some change. Should numerous

corpuscles, including gametes, be retained in the stomach, the number of gametes available for infecting the mosquito is smaller when the stomach is only just filled, and greater when the feeding is kept up for some time, owing to the resultant concentration of the blood. Until recently, *A. ludlowi* in the Dutch East Indies was only known as a coast species inhabiting the sea and brackish-water zone. It has since been found in numbers in valleys in the interior of Sumatra, at altitudes ranging from about 700 feet upwards. For breeding places on the coast *A. ludlowi* requires water containing salt, even if it be present in such small quantity as to be imperceptible to the taste. On steep coasts the breeding-places are therefore near the shore. In the interior of Sumatra the fish-ponds are almost the only breeding-places. These ponds are usually 3–4 feet in depth. If deprived of these, it might adapt itself to rice-fields, where breeding does occasionally take place at present. The development of the larvae of *A. ludlowi* is almost entirely confined to waters containing algae. On the east coast of Sumatra the littoral zone is infested with *A. ludlowi*, but the interior is free. In the course of an examination of seven fish-ponds in the interior only *A. rossi indefinitus* was found. The absence of algae in these ponds may be due to their non-introduction or to the conditions being unsuitable. In the latter case malaria, so far as it is transmitted by *A. ludlowi*, would remain absent from such districts.

Villeneuve (J.). **Deuxième Note sur les Nématocères vulnérants (Dipt.) (Espèces françaises).** [Second Note on some Biting Nematocera (Dipt.) (French Species).]—*Bull. Soc. Entom. France, Paris,* 1919, no. 2, 22nd January 1919, pp. 54–60.

In continuation of a previous list [see this *Review*, Ser. B, vi, p. 113] the following mosquitos, etc., are recorded from France: *Theobaldia* (*Culex*) *annulata*, Schr., *T. longiareolata*, Macq. (*C. spathipalpis*, Rond.); a Mediterranean species, *Taeniorhynchus* (*C.*) *richiardii*, Fic., *Theobaldia* (*C.*) *morsitans*, Theo., *Culex hortensis*, Fic., found in houses throughout France until December and also occurring in Algeria, *C. pyrenaicus*, Brolemann, *C. pipiens*, L., very common both in France and Algeria, *Ochlerotatus maculatus*, Meig. (*C. cantans*, Meig.), *O.* (*C.*) *vexans*, Meig., *C. punctatus*, Meig., generally occurring in salt marshes, *C. albopunctatus*, Rond., *C. quadrimaculatus*, Macq., *O.* (*C.*) *nemorosus*, Meig., and *O. nemorosus* var. *dorsovittatus*, n., *C. jugorum*, sp. n., which is described, and has been found as yet only at high altitudes, *Aëdes cinereus*, Meig., *Anopheles maculipennis*, Meig., *A. bifurcatus*, L., and *A. plumbeus*, Hal. (*nigripes*, Staeg.), and the Psychodid, *Phlebotomus papatasii*, Scop.

Archibald (R. G.) & King (H. H.). **A Note on the Occurrence of a Coleopterous Larva in the Urinary Tract of Man in the Anglo-Egyptian Sudan.**—*Bull. Entom. Research, London,* ix, no. 3, March 1919, pp. 255–256, 2 figs.

The case described in this paper is the first on record of a Coleopterous larva parasitic in the urinary tract of man. The history of the case is given. A specimen of urine under the microscope showed the presence of ova of *Schistosomum haematobium*. The case was

kept under observation, and as the symptoms increased, a douche was tried resulting in the ejection of numerous larvae from the urethral meatus; the treatment was repeated the following day with the same result, after which all symptoms abated. The larvae in question resemble those of a Clerid, though no precise identification is possible.

Froggatt (J. L.). **An economic Study of *Nasonia brevicornis*, a Hymenopterous Parasite of Muscid Diptera.**—*Bull. Entom. Research, London,* ix, no. 3, March 1919, pp. 257–262.

A full description is given of the extent of the work and methods adopted in New South Wales for breeding *Nasonia brevicornis*, the Chalcid parasitising the pupae of *Chrysomyia* (*Calliphora*) *rufifacies*. *N. brevicornis* is a very hardy and easily bred parasite and should prove an important factor in the reduction of blowflies and other Diptera [see this *Review*, Ser. B, iii, p. 15]. Owing to the great economic value of this parasite, measures for its artificial propagation on a large scale have been undertaken. Between November 1917 and 14th February 1918, 164 packets of parasitised pupae, each averaging about 10,000, were distributed and approximately 1,500,000 living parasites were liberated. This work is still extending and fresh requests, from all parts of Australia, are being received daily.

The larvae of *Anastellorhina* (*Calliphora*) *augur*, *Pollenia stygia* (*Calliphora villosa*), *Chrysomyia rufifacies*, *Lucilia sericata*, and to a less extent *Sarcophaga aurifrons*, are the chief source of supply; larvae of *Ophyra nigra* and *Chrysomyia* (*Calliphora*) *varipes* are only used in an emergency, as they are not so readily parasitised by the Chalcid. Among the first four mentioned, the pupae of *Chrysomyia rufifacies* are always the last to be attacked by the parasite. The life-cycle of the Chalcid under normal conditions is 11–14 days. The length of the life of the adult varies under different conditions. Experiments made, show that adults, emerging in glass cylinders covered with muslin, live from 4–6 days; when the muslin was damped with honey and water they lived 18-20 days, but when actively parasitising in the breeding cages they live from 4 to 6 weeks, surviving longer in cool weather.

Duke (H. L.). **Some Observations on the Bionomics of *Glossina palpalis* on the Islands of Victoria Nyanza.**—*Bull. Entom. Research, London,* ix, no. 3, March 1919, pp. 263–270.

As a result of investigations made by himself and others on a number of islands in the Victoria Nyanza, the author has come to the conclusion that the decreased number of flies on these islands is due to the destruction of the breeding grounds by the rising lake. The chief requirements constituting favourite sites for *G. palpalis* pupae are shade and free air circulation accompanied by dry and loose soil, commonly gravel or coarse sand. The favourite breeding places in this group of Islands are those on Damba and Tavu. On Tavu the sandy area chosen by the fly in former years is now covered with thick black mud, the bushes (*Triumfetta macrophylla*) and shrubs

(*Acalypha*), round which a great number of pupae were always to be found, have been mostly washed away, so that here the breeding area has been reduced to a fraction of what it used to be. On Bulago, where the flies were never very numerous, the decrease in proportion is not so great; this is probably due to the less detrimental effect of the rising lake owing to the much steeper shore. Here pupae were only found where the sand or dusty humus was dry to a depth of 2 inches below the surface. On Damba in former years there were numbers of bushes of *Triumfetta* and *Acalypha* growing outside the actual forest zone, and under these pupae were found in large numbers in the dry white sand. In July 1918, 10 men working 4 hours obtained only 1,680 pupae, the majority of which were found around the roots of a large tree at the edge of the forest belt, the trunk of which was just above the 1917 water-level. Wherever dry sand and shade were found, pupae were also found, the majority being within a few yards of the high-water mark. The conclusions arrived at by Fiske in 1914, that if the breeding grounds are restricted, there will be a corresponding decrease in abundance of fly, were borne out by the events of 1917–18. As the lake recedes the fly will become more abundant; this may be prevented by clearing away the *Acalypha* and *Triumfetta* shrubs so that the sun may have free access to the breeding grounds. A permanent rise of the water-level might eliminate *G. palpalis* from the Victoria Nyanza. Certain of the islands are suitable for cattle grazing and with judicious treatment could thus be reopened to a native population. The Ripon Falls are the only outlet to Lake Victoria, and the erection of a permanent dam at this point has been considered and found feasible from an engineering point of view.

Kinoshita (S.). **Chosen-san Kiuketsu-sei *Culicoides* ni tsukite.** [On a Korean blood-sucking *Culicoides*.]—*Dobutsugaku Zasshi* (*Zoological Magazine*), *Tokyo*, xxxi, no. 365, March 15th 1919, pp. 87–88, 5 figs.

The male of *Culicoides miharai*, recorded in a former paper [see this *Review*, Ser. B, vi, p. 224], is here described.

Cowan (Col. J.) & Mackie (Capt. F. J.). **A note upon the Modes of Infection in Bacillary Dysentery.**—*Jl. R.A.M.C., London*, xxxii, no. 3, March 1919, pp. 209–214.

Although the investigations made in 1916 in Alexandria to ascertain the means by which dysenteric infection is disseminated were not completed, one of the conclusions arrived at was that flies play a considerable part in spreading infection by contaminating food and drink. Experiments made with flies fed on dysenteric stools confirmed this view, though those made with flies caught in the latrines of the dysentery wards were negative. As a result of these experiments the danger of infection from this source is not considered serious, especially as the means adopted to combat flies and prevent their access to food and drink have proved successful.

Woodcock (H. M.). **Note on the Epidemiology of Amoebic Dysentery.** —*Jl. R.A.M.C. London*, xxxii, no. 3, March 1919, pp. 231–235.

The possibility of infection with amoebic dysentery through the agency of the common house-fly is fully discussed and compared with other means of transmission. The author does not consider these flies to be a very great factor in the spread of the disease.

Dudgeon (Col. L. S.). **Bacillary Dysentery.**—*Brit. Med. Jl., London*, no. 3041, 12th April 1919, pp. 448–451.

Experiments conducted by Capt. J. F. Taylor on flies as carriers of bacillary dysentery in Macedonia are referred to. It was found that bacillary dysentery was most prevalent when flies were most numerous, the first outbreak of flies in April and May being immediately followed by a great increase in dysentery in May and June, while the second, in September, October and early November, was accompanied by an increase of equal severity. It was also found that flies after contact with food infected with dysentery bacilli were capable of carrying and disseminating these bacilli for at least 24 hours. Dysentery bacilli were isolated from wild flies captured in places in which bacillary dysentery is both endemic and epidemic.

Acton (W. H.). **A Study of the Distribution of Bagdad Boils on the Body made with a View to discover the Transmitting Agent.**— *Indian Jl. Med. Research, Calcutta*, vi, no. 3, January 1919, pp. 262–274, 5 figs. [Received 10th April 1919.]

It has been suspected for a long time that these boils, in which *Leishmania tropica* is found, are caused by bites from infected insects especially flies. The following blood-sucking Diptera have been under suspicion as carriers in Mesopotamia : *Anopheles pulcherrimus*, *A. sinensis* var. *mesopotamiae*, *A. lukisi*, *Stomoxys calcitrans*, *Culex fatigans*, *Stegomyia fasciata*, *Phlebotomus papatasii* and *P. minutus* ; of these, three have been studied by the author.

Stomoxys calcitrans chiefly attacks the legs, but only if covered ; it does not attack bare exposed parts, and although it can bite through a khaki flannel shirt, it will not bite through cotton.

A. pulcherrimus will bite any part of the body as long as the clothing is thin enough for the proboscis to penetrate, but the bites do not correspond with the distribution of boils. The other mosquitos mentioned are too rare to be of importance as transmitters.

The author considers the sandfly (*Phlebotomus*) to be the chief cause of boils in Amara ; it has a peculiar partiality to uncovered hairless areas of the skin and its bites thus correspond with the distribution of the boils. These are rare on the trunk and are twice as common on the arm, which is liable to attack both by day and night, as on the face or leg.

Haughwout (F. G.). **Endemic Malaria in the Philippine Islands as a Military Problem.**—*Philippine Jl. Science, Manila*, xiii, no. 6, sec. B, November 1918, pp. 287–309. [Received 10th April 1919.]

The Nematode, *Filaria bancrofti*, is a blood parasite much to be dreaded in the Philippines, as it is transmitted by *Culex fatigans*

which is a common mosquito in Manila and the vicinity and also has a wide general distribution. In spite of the high death rate from malaria, no efforts are being made to suppress Anophelines, and favourable conditions for their development seem to be increasing in Manila. More deaths occur in the Islands from this disease than from tuberculosis or cholera, as shown in a comparative table.

LEIVA (L.). **Mosquitoes around Manila and Vicinity: a Health Problem.** —*Philippine Jl. Science, Manila*, xiii, no. 6, sec. B, November 1918, p. 339. [Received 10th April 1919.]

The attention of the Manila Medical Society has been called to the presence of Culicine and Anopheline mosquitos in Manila and its vicinity. Owing to the shortened route between the yellow fever zone and Manila due to the opening of the Panama Canal, cases of this disease may pass the quarantine station in the incubation period, and the position will be a serious one should there be a Philippine species of mosquito able to transmit yellow fever. *Stegomyia fasciata persistans*, Banks, has not yet been proved to be a carrier of the disease, but both this and other species of *Stegomyia* are indigenous to the Philippine Islands.

EDWARDS (F. W.). **The Larva and Pupa of *Taeniorhynchus richiardii*, Fic. (Diptera, Culicidae).**—*Entomologist's Mthly. Mag., London*, lv, no. 659, April 1919, pp.83-88.

The hitherto undescribed early stages of this European mosquito have the same remarkable structure and habits as the North American *T. perturbans*, Wlk., both of them living among the roots of water-grasses, from which they obtain their supply of air by the aid of a highly modified spiracular apparatus. During June and July, *T. richiardii* abounds in the winged state round a pond at Letchworth (Herts.), both males and females, the former being much more numerous, hovering among bulrushes and grasses round the water's edge. In June 1918, about half a dozen full-grown larvae were obtained by pulling up some of the water-grass (*Glyceria fluitans*) and shaking out the roots, and in the following November a few half-grown larvae were similarly found, suggesting that probably this species, like *T. perturbans*, hibernates in the larval state, and that there is only one generation in the year.

The breathing tube closely resembles that of *Mansonioides africanus* [see this *Review*, Ser. B, vi, p. 38]. The larva of *T. richiardii* has another remarkable adaptation, which has not been previously observed, consisting of a pair of large air sacs in the thorax, formed by dilatations of the small forwardly-projecting tracheal branches in the first abdominal segment. These, which do not occur in any other British or figured American species, resemble the thoracic air sacs of *Chaoborus* (*Corethra*) and *Mochlonyx*, and perhaps function as oxygen storehouses necessary for hibernation. The pupa is also adapted to a subaqueous existence.

Imes (M.). Cattle Scab and Methods of Control and Eradication.—*U.S. Dept. Agric., Washington, D.C., Farmers' Bull.* no. 1017, December 1918, 29 p., 15 figs. [Received 10th April 1919.]

The parasitic mites causing scabies in cattle belong to the genera *Psoroptes, Sarcoptes, Chorioptes* and *Demodex.*

Psoroptes communis bovis, the cause of common cattle scab has been previously dealt with [see this *Review*, Ser. B, vi, p. 14].

Sarcoptic scabies due to *Sarcoptes scabiei bovis* seems to be increasing east of the Missouri river as well as in the south-western States. It sometimes develops in pure bred cattle and these may carry it without any visible signs of infection at time of shipment. The effects of this disease are more severe than those of common scabies, and it is more difficult to eradicate; if not properly treated the infection may last for years, causing great losses. In dairy herds it may also affect the milk. The parasite is described; the life-cycle is spent entirely on the body of the host. These mites penetrate the upper layer of the skin and form galleries in which oviposition takes place. The egg-laying period probably lasts 12–15 days, each female laying 10–25 eggs. The eggs hatch in 3–10 days, the nymphs after several moults reaching maturity in about 10–12 days. Sarcoptic scabies is transmitted by direct contact, and is contagious to man as well as other animals. In moist protected places away from its host the mite may live 3 weeks or longer, but when exposed to the sun, it dies in a few days. Lime-sulphur or nicotine dip is useful as a treatment, and if used should be repeated about 4 times at intervals of 6–10 days. Dipping in crude petroleum usually kills the eggs as well as the mites, but is sometimes injurious to the animals.

Symbiotic scabies (tail mange) is caused by *Chorioptes bovis bovis*; it is less serious than the two mentioned above, and although contagious to all classes of cattle, it cannot be transmitted from one species of animal to another. Treatment is the same as for common scab.

Demodex folliculorum bovis is responsible for demodectic or follicular mange which occurs in dogs, horses, man and other animals as well as cattle. It is practically incurable, but its progress may be delayed by regular dipping. Should it reach an advanced stage the affected animals should be killed and the rest of the herd dipped as a precautionary measure.

This paper also gives full directions for dipping and spraying cases of scabies. Lime-sulphur dip should be used at a temperature of 95°–105° F.; to make it, 12 lb. of unslaked lime or 16 lb. of commercial hydrated lime should be formed into a thin paste with water, and 24 lb. of flowers of sulphur should be sifted into the paste and mixed well to the consistency of mortar with the addition of water. The mixture should then be added to 30 gallons of boiling water, taking care not to interrupt the boil which should continue for 1½–2 hours until a dark amber colour is reached. The constituents must not be allowed to settle to the bottom whilst boiling, but when cooling the liquid should be allowed to stand until all solids have settled, leaving it clear. For use this should be diluted with warm water to make a total of 100 gals. of dip.

Nicotine dips, to be efficacious, should be used at a strength of $\frac{1}{20}$ of 1 per cent. nicotine; if used stronger they are injurious to

cattle. They should be used at the same temperature as the lime-sulphur dip, and flowers of sulphur may be added to them at the rate of 16 lb. to every 100 gals. of diluted dip.

If a petroleum dip is used the vat should be filled with water to within 12 or 18 inches of the dip line; to this crude oil is added until it reaches the dip line; these dips are used cold and the cattle should be protected from the sun for several days after they have been applied.

Dyar (H. G.) & Knab (F.). **New Species of Tropical American Mosquitoes (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vii, no. 1–3, January–March 1919, pp. 1–9.

The species dealt with are:—*Wyeomyia prolepidis*, sp. n., and *W. fauna*, sp. n., from the Panama Canal Zone; *Sabethinus moerbista*, sp. n., from British Guiana; *Lestiocampa moralesi*, sp. n., from Guatemala; *Culex bonneae*, sp. n., bred from larvae found in water barrels, puddles and tree-holes in Dutch Guiana; *C.* (*Microculex*) *chryselatus*, sp. n., bred from larvae in epiphytic Bromeliaceae in Dutch Guiana; *C.* (*Melanoconion*) *ocossa*, sp. n., from British Guiana and possibly identical with *C.* (*M.*) *aikenii* (*Gnophodeomyia inornata*, Theo.), the larvae being abundant all the year round in freshwater canals in company with those of *Aëdomyia squamipennis*, and the adult, which is a blood-sucker, sometimes visiting houses at night; and *Aëdes thaxteri*, sp. n., bred from larvae in bracts of *Heliconia* from Grenada.

Dyar (H. G.). **A Note on *Lesticocampa*, and a New Species (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vii, no. 1–3, January–March 1919, pp. 9–11.

Lesticocampa trichopus, sp. n., is described from Brazil.

Dyar (H. G.). **Westward Extension of the Canadian Mosquito Fauna (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vii, no. 1–3, January–March 1919, pp. 11–39.

Typically Canadian mosquitos are:—*Aëdes punctor*, Kirby, the eastern limits of which are known, but the westward extension of which in the Rocky Mountains has not yet been determined; *A. lazarensis*, Felt & Young, an aberrant form of which occurs in the Rocky Mountains, almost to the exclusion of the normal form; *A. pionips*, sp. n., the large, dark-coloured larvae of which have been found in small mossy pools in a spruce swamp; *A. diantaeus*, H., D. & K., described from New Hampshire, the larvae occurring in mossy pools in a spruce swamp; *A. decticus*, H., D. & K., a species extending slightly beyond the Canadian region, having been taken in New York and Minnesota; *A. prodotes*, Dyar, the Rocky Mountain form of the preceding species, the larva being unknown; *A. intrudens*, sp. n., the only species of the genus of which the adults persistently enter houses, and which ranges throughout and slightly beyond the Canadian fauna, having been recorded from Massachusetts; *A. excrucians*, Wlk., a species occurring throughout the Canadian area and extending

beyond it, in the east as far south as New Jersey, while its westward limits are not yet known; *A. fitchi*, Felt & Young; *A. riparius*, D. & K., described from Winnipeg, the larva being unknown; *A. fletcheri*, Coq., a species supposed to be peculiar to the prairies, but which also occurs in the forest; *A. canadensis*, Theo., not confined to the Canadian zone, but extending in the east to Florida and being widespread in the northern forests, where the larvae frequent open pools and roadside ditches; *A. vexans*, Meig., widely distributed in temperate regions in both Europe and America; *A. cinereus*, Meig., a species widespread in north temperate regions in Europe and America; *Culicella dyari*, Coq., a species fairly closely confined to the Canadian region and not extending far beyond it, the males being strongly attracted to light; *Culex restuans*, Theo., found rarely in the forested regions in the east, but ranging well to the south along the Atlantic seaboard, the larvae inhabiting open pools in company with *Aëdes canadensis*; *Anopheles occidentalis*, D. & K., widely distributed in the western United States, following the Canadian forests eastward, but rare in the north; *Taeniorhynchus* (*Mansonia*) *perturbans*, Wlk., a widespread species found in the timbered country in the lake region; *Theobaldia* (*Culiseta*) *impatiens*, Wlk., a species characteristic of the Canadian fauna, but extending to the Pacific coast, and the mountains of California.

Species entering the margin of the Canadian zone include:—*Theobaldia* (*Culiseta*) *inornata*, Will., widely distributed throughout the United States, entering the Canadian region only in mild, open localities; *T.* (*C.*) *incidens*, Thoms., a Pacific coast species entering the Canadian region only in the Rocky Mts.; *C. alaskaënsis*, Ludl., a northern species entering the Canadian zone in the Rocky Mountains; *Aëdes pullatus*, Coq., abundant in the higher Rockies, breeding in open muddy pools near lakes and rivers; *A. hirsuteron*, Theo., occurring at the eastern limits of the Canadian fauna and extending well to the south; *A. vinnipegensis*, sp. n., the male and larva being unknown, which occurs in the eastern wooded prairies; *A. trichurus*, Dyar, a western form, the corresponding eastern one being *A. cinereoborealis*, Felt & Young, while *A. poliochros*, sp. n., is suggested for the intermediate form from Manitoba; *Culex saxatilis*, Grossb., widely distributed in forested regions from ocean to ocean and from Canada to Mexico, the larva occurring at Winnipeg Beach, Manitoba, in roadside puddles; *Aëdes spenceri*, Theo., a strictly prairie species; and *A. curriei*, Coq., a characteristic prairie species which does not enter the wooded Canadian zone at all, but is found wherever open grassy spots occur, even well into the Rocky Mountains.

BARRET (H. P.). **Observation on the Life History of *Aedes bimaculatus*, Coq. (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vii, no. 1–3, January-March 1919, pp. 63–64.

The larvae of *Aëdes bimaculatus* are recorded from a "sink hole" in a thicket at the edge of the city of Charlotte, N. Carolina. These larvae were found lying almost parallel to the surface of the water in a position formerly regarded as characteristic of *Anopheles* and *Uranotaenia* only. This species has previously been taken in Texas, Louisiana, Mississippi and Arkansas, but not in N. Carolina.

Dyar (H. G.). **A Note on Argentine Mosquitos (Diptera, Culicidae).**—*Insecutor Inscitiae Menstruus, Washington, D.C.*, vii, no. 4–6, April–June 1919, pp. 85–89.

A list is given of the mosquitos recorded as occurring in Argentina. Several of these species have been examined by the author, who adds notes on the following :—*Culex pipiens*, L., of which *C. flavipes*, Macq., is a synonym, the identity being easily established from the genitalia ; *C. bonariensis*, Brèthes, a distinct species of true *Culex* ; *C. brethesi*, sp. n., previously described as the male of *Aëdes lynchii*, Brèthes, which latter may prove to be a synonym of *A.* (*Heteronycha*) *dolosa*, Lynch Arribálzaga ; *A. albifasciatus*, Macq., of which the male genitalia are described ; *Janthinosoma* (*Psorophora*) *oblita*, Lynch Arribálzaga, and *J. centrale*, Brèthes, both of which are synonyms of *J. posticata*, Wied.

Miller (D.). **Some Noteworthy Flies affecting Live-stock.**—*New Zealand Jl. Agric., Wellington*, xviii, no. 1, 20th January 1919, pp. 10–14, 13 figs. [Received 14th April 1919.]

There is no record of any indigenous fly attacking domestic animals in New Zealand, a fact probably due to the absence of any suitable mammalian hosts before the advent of Europeans. Steps should nevertheless be taken to guard against the possibility of native species developing injurious habits.

Pollenia stygia (*villosa*) (golden-haired blow-fly) is a native of Australia and does not breed only upon the wool of sheep, but in any decaying matter (particularly animal), the wool-blowing habit being apparently recently acquired. In New Zealand it is a very abundant species, often found in houses, where it infests meat. On sheep the maggots move from the blown wool and burrow into the skin, and may sometimes enter the vagina of ewes, and in cases of footrot they often occur in the feet. Pupation takes place in some sheltered spot upon or in the ground.

Lucilia sericata (greenbottle fly), *Calliphora erythrocephala* (European blue-bottle) and *C. quadrimaculata* (New Zealand blue-bottle) are species of blow-flies that should be closely observed in regard to the possible damage to wool.

Blood-sucking flies include *Stomoxys calcitrans* and a closely allied species found in large numbers in the vicinity of water at Auckland, and also the Hippoboscid, *Melophagus ovinus* (sheep tick or ked), the life-history of which has already been noticed [see this *Review*, Ser. B, v, p. 191].

Rodhain (J.). **Observations médicales recueillies parmi les Troupes coloniales belges pendant leur Campagne en Afrique Orientale. 1914-1917.** [Medical Observations made among the Belgian Colonial Troops during their Campaign in East Africa. 1914–1917.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 3, 12th March 1919, pp. 137–158, 2 figs.

Among the diseases to which Belgian colonial troops in East Africa were liable during their campaign in 1914 were several that are insect-borne. The whole of the ex-German territory of East Africa is uniformly

infested by *Ornithodorus moubata*, the tick conveying *Spirochaeta duttoni*, which is the causal agent of African relapsing fever. Many of the Congolese soldiers had not previously been bitten by this tick, and in many localities infections were numerous, the disease becoming one of the most serious factors of mortality among the troops and one-sixth of the deaths being due to this cause. The sanitary service issued recommendations for the prevention of the disease, but for a long time these were of little avail owing to the native habit of sleeping whenever possible in native houses and thus becoming infected and carrying infection into the cantonments. During the offensive of 1917, however, the disease became quite a secondary danger; the troops had learnt to fear the ticks and had less occasion to frequent infected houses, while the supply of the necessary drugs had been greatly increased.

Malaria was also the cause of a high degree of mortality among natives. The territories of German East Africa occupied by Belgian troops consisted chiefly of high, mountainous pastures, inhabited by natives who are accustomed to a relatively cold climate where malaria is rare or non-existent, and who know by experience that when they go down to the plains they return with a tenacious fever which they dread. During the 1917 campaign a number of these natives were employed as carriers for the Belgian troops, but their employment soon had to be abandoned owing to the high proportion of deaths and cases of sickness among them due to the malaria that they so readily contracted, which was of the malignant tertian form. The liability to malarial infection by natives inhabiting a country where malaria is practically unknown, when removed to malarial regions, is well-known and had been foreseen by the military medical service.

King (W. W.). **A Note on the Flight of Mosquitoes through horizontal Water-pipes.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 9, 28th February 1919, pp. 386–390, 1 fig. [Received 16th April 1919.]

Particulars are given of observations made in the Virgin Islands that led the author to the conviction that mosquitos pass in and out of perpendicular spouts but do not enter through those that have a considerable horizontal section, though a horizontal pipe as much as 200 feet long did not prevent their escape when breeding in cisterns. The mosquitos in question were provisionally identified as *Culex fatigans* (*quinquefasciatus*).

Le Prince (J. A.). **Mosquito Control about Cantonments and Shipyards.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 12, 21st March 1919, pp. 547–553.

The measures adopted in military cantonments and shipyards in the United States to control mosquitos, are described, thus minimising the spread of malaria amongst the troops. In some places temporary measures were resorted to until complete drainage could be undertaken. The work proved successful, the Anophelines being kept under control over an aggregate area of 1,200 sq. miles. The measures in question also effected a marked reduction in the malaria rate among the civil population in the neighbourhood of the areas dealt with.

HUTCHINS (E.). **Annual Report of Chief Veterinary Officer.**—*Uganda Dept. Agric. Ann. Rept. for the Year ending 31st March 1918, Kampala*, 1918, pp. 36–41. [Received 19th April 1919.]

Deaths of cattle from trypanosomiasis were not quite so numerous as in previous years though several outbreaks occurred, one trader losing 21 out of 25 oxen from *Trypanosoma pecorum*, and in another district 80 out of 108 transport oxen became infected. The disease in this case appears to have been mainly spread by TABANIDAE, especially *Tabanus africanus*. Another outbreak was reported where *Glossina fusca* occurred. No outbreaks of trypanosomiasis have been recorded in Busoga amongst transport oxen since the road on which *G. pallidipes* was found in 1916 was closed. *Stomoxys calcitrans* is considered to be chiefly concerned in spreading *T. pecorum* and *T. vivax* at Kampala. Some extensions of the previously known distribution of *Glossina morsitans* are reported. Several deaths occurred amongst transport oxen from African Coast fever and anaplasmosis, and a number of dogs were treated for piroplasmosis.

LOW (G. C.). **Antimony in the Treatment of American Leishmaniasis of the Skin.**—*Brit. Med. Jl., London*, no. 3042, 19th April 1919, pp. 479–480.

A case is recorded in British Honduras of infestation of man with the larvae of *Dermatobia hominis* (*cyaniventris*), 30 maggots being removed from various parts of the body. A sore subsequently appeared on the pinna of the right ear, from which, $2\frac{1}{2}$ years later, *Leishmania americana* was isolated. No treatment checked the progress of the disease until antimony ointment was tried 5 years later, followed by intravenous injections of antimony tartrate continued over a period of 4 months; this resulted in a complete and permanent cure, no secondary buccal lesions developing.

BASSETT-SMITH (P. W.). **Naval Cases of Malaria contracted in England, 1918.**—*Jl. R.N.M.S., London*, v, no. 2, April, 1919, pp. 201–202.

During 1918 nine fresh naval cases of malaria were reported in England, of which only two had ever been abroad and neither of these had had previous attacks. Most of the cases occurred in the spring. Many specimens of *Anopheles maculipennis* were found in marshes in Suffolk and this species also occurred among mosquitos sent from Kent, as well as larger numbers of *Culex pipiens*. All cases were treated at once and placed under mosquito nets until they could be transferred to non-malarial districts. The pools were paraffined to destroy the larvae, and the edges kept free of grass, the area involved being so large that it was impossible to adopt more extensive measures.

MALONE (A. E.). **A case of Malaria contracted in England.**—*Jl. R.N.M.S., London*, v, no. 2, April 1919, p. 202.

A case of malaria is recorded from Pembroke dock. The man in question had never been abroad but had lived in H.M. Dockyard, Sheerness, from January 1916 to April 1918. There is, however, a

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possibility of the infection having been acquired from men invalided home in consequence of malaria.

Anopheles bifurcatus and *A. plumbeus* have been found in the neighbourhood, but not *A. maculipennis*. The first mentioned is an active malaria carrier abroad, but has not been proved to be so in England.

JAMES (Lt.-Col. S. P.). **Malaria contracted in England.**—*Trans. Soc. Trop. Med. Hyg., London*, xii, no. 3, 17th January 1919, pp. 37–51.

The total number of civilian cases of malaria for 1918 in England was 67, 43 of which are believed to have contracted the disease in or before 1917. The majority of cases occurred in north-east Kent. In England it is probable that two independent conditions of malaria have to be dealt with. One is due to a foreign strain of the parasite arising from the importation of exotic malaria and the other a true indigenous malaria due to a parasite which has always been in the country. The latter seems to be localised in certain streets and houses, which would seem to indicate that the mosquito concerned spends most of its life in the immediate vicinity of the place where it obtained its first meals of blood.

In 1918 most relapses occurred in April and May, although adult Anophelines were not found in dwelling houses until July. The first found in June were only in stables. *Anopheles maculipennis* seems to be the sole agent of infection in Queenborough. Measures were at once taken to discover and control the cases and carriers.

During the discussion following this paper, Mr. A. J. Grove stated that three areas, in Essex, Kent and near Shrewsbury in Shropshire, had been selected for observations. The first two of these had a previous history of malaria, and the third had not, being selected to serve as a sort of control. The results obtained showed a marked decrease in the numbers of *A. maculipennis* until the end of May, the new brood appearing at the beginning of June and reaching its maximum about September, after which the numbers began to decline. Although *A. bifurcatus* and *A. plumbeus* were sometimes found in numbers, counts of these species could not be made. Larvae of *A. bifurcatus* were found in decreasing numbers until the end of April, after which they apparently disappeared until June; those of *A. plumbeus* were not found at all and those of *A. maculipennis* from May to September. The chief factors necessary for a building to be favoured by mosquitos are the continued use of the building by animals; the absence of draughts, particularly near the roof; comparative stability of temperature; and the intensity of light. The invasion of houses is probably associated with the swarming of the insects for pairing purposes.

Capt. A. Macdonald stated that he had found *A. maculipennis* during the winter in the warmth and shelter of stables and that during warm weather it wandered into houses; *A. bifurcatus* on the other hand is very seldom found in human dwellings. He was of opinion that malaria has occurred in the British Isles in the past, and that, given a coincidence of optimum conditions, extensive but temporary epidemics of the disease might arise.

Sir Ronald Ross expressed the hope that further investigations will be made as to the correctness of the author's hypothesis that there are two strains of benign tertian parasites in England.

BOUSFIELD (L.). **Malaria, with reference to (1) the Danger of imported Anopheline Insects, (2) an unusual Breeding Ground.**—*Trans. Soc. Trop. Med. Hyg., London*, xii, no. 3, 17th January 1919, pp. 52–58, 2 figs.

Besides the natural sources of infection from malaria in Khartoum, there is a large traffic in steamers, native boats and trains coming from highly malarious districts. Since preventive measures have been adopted the town has been very free from infection until recent years. This is accounted for by the increased native boat traffic to supply wood owing to the shortage of coal. The boats travel slowly down the Nile from malarious districts and are moored to the banks at night; mosquitos come on board them and having fed on the native crew, shelter in the cargo and remain undisturbed until it is unloaded. As the Anophelines found on board are usually females, it is believed that human blood is the attraction; they very seldom breed on board, whereas *Culex* and *Stegomyia* frequently do so. Mosquitos have been found in houses near the river bank that had been free from them for months.

Details are given of the anti-malarial measures adopted in the district.

Anopheles (*Pyretophorus*) *costalis*, *Culex fatigans* and *Stegomyia fasciata* breed locally, whereas *Anopheles* (*Cellia*) *pharoensis* and an unidentified species of *Culex* have been found in houses near the river banks and trains, but do not breed locally. When the Nile receded in 1917, after the inundation around Khartoum, a mud flat was formed by the deposited silt in which Anopheline larvae, probably those of *A. costalis*, were found.

HORNBY (H. V.). **The Trypanosomes found in Domestic Mammals in South Central Africa.**—*Vet. Jl., London*, lxxv, no. 4, April 1919, pp. 128–138.

The following is the author's summary of this paper: The common trypanosomes found in domestic mammals in South Central Africa are three in number viz:—*Trypanosoma brucei*, *T. congolense* and *T. vivax*. They are readily distinguishable by their morphological characters. *T. brucei* is very fatal to equines, smaller ruminants and dogs, but is almost non-pathogenic for cattle. *T. congolense* is the commonest cause of trypanosomiasis of cattle, but it is also pathogenic for other domestic mammals. *T. vivax* resembles *T. congolense* in the forms of disease it causes in stock. Dogs are generally immune to its ill-effects.

The distribution of these parasites is coincident with that of tsetse-flies. Different strains of the same species of trypanosome vary greatly in their range of virulence. Individuals and races of the same species of domestic animals vary greatly in the resistance they offer to infection. The presence in the blood of one species of parasite appears to inhibit the development of another.

A fourth species—*T. simiae*—causes disease in pigs. It is conceivable that it may be only a variety of *T. congolense* modified by passage through the warthog.

Rice Culture and Malaria.—*California State Bd. Health Mthly. Bull., Sacramento,* xv, no. 8, February 1919, p. 270.

Owing to the increase in rice cultivation in California, the malaria problem will require greater consideration; for this reason special work is to be undertaken in the eradication of mosquitos from the cultivated districts.

Johnson (T. H.) & Bancroft (M. J.). **Report on Mr. Munro Hull's Claims regarding Tick-resisting Cattle.**—*Queensland Agric. Jl. Brisbane,* xi, no. 1, January 1919, pp. 31–35.

The question of the tick resistance of cattle has been investigated by the authors during the years 1915–1918, special attention having been given to the animals forming part of Mr. Hull's herd, concerning which the latter put forward certain claims in 1912. He maintained (1) that on these cattle only a few female ticks (50 to 100) mature in the year, though they are regularly (naturally) infested by myriads of larvae; (2) that they do not require any attention as regards ticks, and may be turned out on any country for indefinite periods without experiencing tick worry; (3) that this peculiarity is transmissible to other cattle by contact and by vaccination and is always transmitted to their progeny, in which, however, it does not manifest itself until after the first year of life; (4) that the material used for vaccination (the exudate on the escutcheon of resistant stock) does not result from excessive tick worry; (5) that the few female ticks found maturing on such animals have been displaced without injury from other cattle and have re-attached themselves to the resistant stock; (6) that though these ticks oviposit, no larvae develop; (7) that a few ticks are to be found on such animals at odd times during winter when other cattle are free from them; (8) that such cattle have a markedly higher temperature during winter.

In 1914 Mr. C. J. Pound, as a result of his observations regarding two tick-resistant cows purchased by the Government, reported adversely on the above claims, disagreeing with every point.

In 1915 Mr. Hull again restated his claims, and, as a result of further observations, modified certain of them, as follows:—The number mentioned under point (1), was in many cases underestimated, many of the minute ticks continuing to develop but dying before engorgement; that certain cases of transmission of resistance (3) are really due to contact; and that in one case the exudate appeared on a calf during the first year of life.

In 1918 one of the authors made a detailed study of Mr. Hull's cattle for a prolonged period, during January, February, March and June, when all the engorged ticks to be found on resistant animals were carefully collected, most of the cattle being inspected twice daily, and the non-milkers once daily. A thorough collection from 9 supposed resistant cows during a period of 27 days at the height of the tick season yielded only 13 fully matured ticks, though control

heifers from another district showed a fairly heavy infestation. In the opinion of the authors no stronger evidence could be adduced to prove the presence of a very marked tick resistance in these animals. In practically all other cases examined or reported by others, these animals retained their resistance even when moved to other districts and did not require any treatment to prevent tick worry if they were kept in fair or good condition, these being the first 3 points claimed originally by Mr. Hull. Though departmental findings on 2 selected cows were exactly the opposite of the above, it may be conceded that they were probably correct when the animals were subjected to abnormal circumstances, such as poor condition, intense artificial infestation, etc. Further observations on the fertility of engorged ticks from resistant animals showed the existence of some impairment of vitality as proved by the lessened number of viable eggs. The authors do not support the claim that the ticks on resistant cattle have developed on other animals and re-attached themselves, and they explain the occurrence of the few ticks found in winter, when other cattle are free, by the fact that these occurred on milkers, which are frequently in low condition during winter; they further found that the registered temperatures of resistant cattle during summer were approximately normal.

In reply to a published appeal for observations by farmers [see this *Review*, Ser. B, vi, p. 187] it is stated that Brahmin cattle and crossbreds are more or less strongly resistant. In Queensland resistance is not confined to any one breed but seems to be more common among Jerseys and Jersey crosses, perhaps on account of their fine short hair and oily skin. Individual animals of various other breeds and their crosses may possess a marked resistance, due to individual idiosyncracy. Resistance in animals from isolated localities, usually in the vicinity of scrub country is perhaps due to the more abundant fodder maintaining them in better condition. The claim that the application of an arsenical dip or wash temporarily suppresses resistance does not seem to hold good, provided that the condition of the animals is not lowered by the treatment.

After collecting all the available evidence concerning the hereditary transmission of resistance by vaccination and by contact, the authors conclude that in certain cases this does occur, though they have not succeeded in transmitting it by vaccination with exudate to any of their experimental animals, nor has resistance developed in animals kept in contact with resistant ones for periods varying from 1–7 years.

They conclude that the condition is naturally acquired as a direct result of moderate, long-continued infestation, which causes the production of an anti-tick substance in the blood and other fluids of certain cattle. In view of the greater probability of undipped animals dying of tick worry than of becoming resistant, dipping in conjunction with a rotation of paddocks should be systematically carried out in order to control the ticks and assist in their eradication.

Associated with tick resistance there may be an exudate forming small granular masses of thin flat yellow scabs, this condition appearing to graduate into a type of tick-sore, so far noticed only on resistant animals. The exudation makes its appearance particularly during the warmer months (October to June), and especially during the

moist weather, first occurring before the presence of ticks is noticed, though the larvae begin to infest cattle some time before their presence is obvious to an ordinary observer.

The authors agree with Mr. Pound that the condition is the result of tick attack, but not, as he claims, an ordinary tick-sore, and they agree with Mr. Hull that it is not the result of irritation caused by excessive tick worry.

POUND (C. J.). **Report on Mr. Munro Hull's Claims regarding Tick-resisting Cattle.**—*Queensland Agric. Jl., Brisbane*, xi, nos. 1 & 2, January & February 1919, pp. 36-39 & 76–78.

Commenting on Mr. Hull's first claim that the number of female ticks maturing on tick-resistant animals is small, the author remarks that the number of ticks found on cattle in infested areas is extremely variable and largely due to the conditions of environment. Gross tick infestation and so-called tick-resistance are not by any means constant, *i.e.*, at variable periods a heavily infested animal may become lightly infested or a so-called resistant one heavily infested, obviously necessitating the dipping or spraying of these alleged tick-resistant cattle.

Concerning the remark in the previous report [see above] that the two cows selected for departmental experiment were subjected to abnormal conditions, the author states that when in his charge they were well fed and specially cared for, and not subjected to conditions likely to produce a lowered resistance; and further, they were sprayed periodically with other cattle in order to keep down gross tick infestation.

With reference to the view that the influence of food is a factor in the degree of infestation, the author points out that fat, healthy cattle from shows are readily susceptible to tick invasion, and that the experience of those who have for years closely observed good healthy cattle on station properties, and the constant arrival of fat, healthy, tick-infested cattle at meat factories does not support it.

In an appendix the author categorically negatives the claims [see previous paper] advanced by Mr. Hull in respect of the two alleged tick-resistant cows lent for departmental investigation.

BROWN (W. G.). **Conclusions to Date upon the Experiments by the Department of Agriculture and Stock in Relation to the best Means to cope with the Maggot-fly Pest in Sheep.**—*Queensland Agric. Jl., Brisbane*, xi, no. 2, February 1919, pp. 60–63.

The results of 5 years' experimentation on the control of the maggot-flies in sheep show that, generally speaking, the specifics used with success are more or less poisonous. One or two non-poisonous and easily soluble ones have given fairly good results, though they are liable to be washed out of the wool by heavy tropical rains. The effects of crutching remain good for about 3 months, but the large amount of expensive labour required renders the method impracticable

except in small flocks. Spraying with poisonous dips at intervals of 3 months, with a pressure of not less than 120 lb. per square inch has given good results, it having been found that with a race 3 ft. wide and 50 ft. long, 3 men are able to treat about 2,000 sheep a day. Adult flies are held in check by means of traps and poison-baits and by insectivorous birds, and the larvae are devoured by mice and are parasitised by Chalcids. Arsenic in its crude form is effective for killing both the flies and the maggots, but care is necessary in its use owing to its little-known effect upon the health of the sheep. An arsenical dip in use for over 30 years in England and consisting of white arsenic 50 lb., caustic soda 4 lb., carbonate of soda 20 lb., soft-soap 35 lb., sulphur 30 lb., water 25 gals., one gallon of which mixed with 59 gals. water forms a one-minute dip, has, on one occasion, been known to kill a large number of sheep. Sheep with 2 months', 6 months' and 8 months' wool dipped twice and thrice in a poisonous dip came through the fly season well and yielded a good fleece. It is believed by many that flies are very local, but they are known to follow sheep into a fresh paddock, though they are generally picked up by the sheep in camping places, water-holes, shearing-sheds, lamb-marking yards, etc., where they breed. Nothing has, as yet, been found, either poisonous or non-poisonous, which will prevent flies from attacking sheep. The health of the sheep has a marked influence on the incidence of the maggot-fly, and for that reason all sick sheep should be isolated from the flock when flies are active, and sheep suffering from internal parasites should be regularly treated. Density of wool, when excessive, seems to be a predisposing cause of fly-attack, since crossbreds do not suffer nearly so much as merinos in this respect. In regard to sex, maiden ewes in every breed are the most susceptible animals. The order of the seasons in which sheep are most liable to attack are:—Spring, autumn, wet winters and summer. In dry weather the flies are little in evidence.

Salmon (D. E.), Gallagher (B. A.) & Foster (W. D.). **Important Poultry Diseases.**—*U.S. Dept. Agric., Washington, D.C., Farmers' Bull.*, no. 957, March 1918, 48 pp., 10 figs. [Received 28th April 1919.]

The information contained in this paper has been previously dealt with [see this *Review*, Ser. B, i, p. 115, iii, p. 158, v, p. 173, vi, pp. 14, 142].

Guitel (F.). **La Station entomologique de la Faculté des Sciences de Rennes en 1917.**—*Insecta, Rennes*, viii, 1918, no. 85–96, pp. 177–181. [Received 29th April 1919.]

The Argasid tick, *Ornithodorus coniceps*, is reported from the Department of Aude, and is recorded for the first time as biting man in France. During the years 1915–1917, leaflets concerning insects injurious to troops in the field have been constantly disseminated among the army, and large quantities of sublimated sulphur for use against *Pediculus humanus* (*vestimenti*) were distributed.

LEEFMANS (S.). **Bijdrage tot de Biologie van de Wandluis, *Cimex lectularius*, L., en tot zijne Bestrijding.** [A Contribution to the Biology of *Cimex lectularius* and to its Control.]—*Teysmannia, Batavia*, xxx, no. 1, 1919, pp. 12–30, 1 plate.

The species of bed-bug found in the Dutch East Indies is illustrated, and is believed to be *Cimex lectularius* * the identity and synonomy of which is discussed. It is seldom found permanently in the stone houses of Europeans, but occurs in the wooden dwellings of the natives and also in hotels, etc. The presence of these insects causes no concern to the natives, who appear to be immune to the effects of their bites, though this is not the case in Europeans. Experiments showed that hungry bugs will feed in daylight; the time of feeding varied from 4 to 12 minutes. The longest time that a nymph was observed to live without food was 34 days; in the case of adults this period was 19 days. Eggs laid on 1st February hatched on the 10th February and the bugs were full-grown on 18th March. At Buitenzorg the nymphs reached maturity after the fifth moult. The section dealing with remedial measures reviews the various known methods for dealing with this pest.

GEDOELST (L.). **Notes sur les Oestrides.**—*Rev. Zool. Africaine, Brussels*, iv, no. 2–3, April 1915 and December 1916, pp. 144–161, and 259–264. [Received 3rd May 1919.]

A new Oestrid genus *Kirkia*†, having recently been erected [see this *Review*, Ser. B, ii, p. 91] for larvae the type of which was described for the first time by Blanchard in 1893, the author deals with four sets of larvae which evidently belong to a single species of this genus, for which he proposes the name *Kirkia surcoufi*, sp. n. These were obtained respectively from the frontal sinus of *Bubalis* sp. from Shari, of *B. major* from Upper Senegal and the Ivory Coast, and of *B. lichtensteini* from Portuguese East Africa. The larva originally described differs from these and seems to constitute a distinct species, for which the name *K. blanchardi* is proposed.

Gedoelstia cristata, Rodh. & Beq., originally described as a parasite of *Bubalis lichtensteini* from Katanga, is now recorded from *Bubalis cokei* and from *Connochaetes albojubatus* in East Africa. *G. hässleri*, sp. n., is described from larvae from antelopes in the Niger delta, from Abyssinia, and from the nasal cavities of *Damaliscus lunatus* in Uganda.

A key to, and descriptions of, the species of *Cobboldia* are given, viz.:—*C. parumspinosa* from the basin of the Zambesi, *C. roverei* from the Belgian Congo, *C. loxodontis* from the Ivory Coast, Lake Chad, Uganda and the Gold Coast, and *C. elephantis* from Asia.

Oestromyia marmotae, sp. n., is described from a larva enclosed in a cyst in the subdermal tissue of the paw of a marmot from Central Asia.

Other new species described are:—*Oestrus disjunctus*, from the nasal cavities of *Hippotragus equinus* in Katanga; *O. compositus*, from unknown hosts in British East Africa, Mozambique, Abyssinia and the Sudan, similar larvae, parasitic in *Bubalis lichtensteini*, having been received from Katanga; and *Hypoderma gazellae*, from the dorsal muscle of the skin of *Gazella granti* from East Africa.

[* Judging by the figure, it is more probably *C. hemiptera*, F.—ED.]

[† *Kirkioestrus* has since been proposed in place of this name which is preoccupied, see this *Review*, Ser. B, iv, p. 22.—ED.]

RODHAIN (J.) & BEQUAERT (J.). **Matériaux pour une Etude monographique des Diptères de l'Afrique. Troisième Partie. Diptères Parasites de l'Eléphant et du Rhinoceros.**—*Bull. Biol. France et Belgique, Paris*, lii, no. 4, 25th March 1919, pp. 379–465, 21 figs.

At the present time five species of Dipterous larvae parasitic on elephants are known. The African elephant is the host of four species, all of which have been met with in the Belgian Congo, two infesting the stomach and intestine, one the oesophagus and one the sole of the foot. The Asiatic elephant has so far been found to harbour one only, in the stomach, though it is certain that investigation would result in the discovery of many more. Treatises on the care and treatment of the Indian elephant contain vague references to the presence of Dipterous larvae in different organs. In Burma such parasites are mentioned as occurring in tumours of the skin, on the head, the ears and the body.

Neocuterebra squamosa, Grünb., a parasite of the sole of the foot, was first described in 1906 and is far rarer than parasites of the digestive tract. The larvae occur in the inner dermal layer, which is very thick and hard, almost cartilaginous, their position being irregular and horizontal rather than vertical. The adult fly has never been reared.

Pharyngobolus africanus, Br., the larva of which is parasitic in the oesophagus of the African elephant, has probably the same distribution as its host, but it has hitherto been met with very rarely. The only two adults that have been reared are in such bad preservation that it is impossible to describe them or to determine their systematic position. The mature larvae detach themselves from the wall of the gullet and pass through the alimentary tract, being found in the morning in freshly deposited excreta, from which they burrow into the soil to pupate; they are therefore never found in old excreta. The pupal stage lasts for 20 or 21 days.

The numerous gastricolous larvae received from the Belgian Congo, and from which it has been possible to rear the adults, belong to two quite distinct species, *Cobboldia chrysidiformis*, Rodh. & Beq., and *C. loxodontis*, Br., the pupal stage of both being 19 or 20 days. Mating and oviposition have frequently been observed in the case of *C. chrysidiformis*, but not in *C. loxodontis*.

A third allied species parasitic in the stomach and intestine of the Asiatic elephant is *C. elephantis*, Steel, the adults and third stage larvae of which are known, but in which oviposition has not yet been observed. The pupal period is short, only 16 days elapsing between the expulsion of the mature larvae and the emergence of the adult fly.

Rhinoceros Oestrids belong to four species:—*Gyrostigma sumatrensis*, Br., described from larvae in the stomach of *R. sumatrensis* and *R. lasiotis* from individuals that died in captivity; *G. conjungens*, described from larvae in the stomach of *R. bicornis* from East Africa, the adults of both these species being unknown; *G. meruensis*, Sjöst., described from larvae in the stomach of *R. bicornis*, from East Africa, and from an adult female captured in Abyssinia, the male being unknown and the length of the pupal period being about 6 weeks; *G. pavesii*, Cort., described from larvae in the stomach of the African *R. bicornis* and *R. simus cottoni* and from adults of both sexes. The

duration of the pupal stage of flies reared in the laboratory was 36, 37 and 38 days respectively. In its general form the egg of this species strongly resembles that of *Gastrophilus equi*.

TAKATSUKI (A.). **Mosquito Control by means of Petroleum.**—*Kyoto Jl. Med. Sci., Kyoto*, xiv, no 7, 20th November 1917, pp. 117–118. (Abstract in *China Med. Jl., Shanghai*, xxxiii, no. 2, March 1919, p. 166.) [Received 5th May 1919.]

The action of heavy mineral oils on mosquito larvae is not so much a mechanical process of obstructing the breathing pores of the immature stages as a rather acute intoxication. Other oils that are relatively inert, such as rape-seed oil, etc., do not cause death nearly so readily. The author finds that the breathing siphon does not stain with ordinary water-soluble dyes, but is intensely coloured by Sudan III suspended in petroleum, from which he concludes that some fat-like substance is present in that organ which combines with the petroleum to the injury of the body as a whole.

According to this hypothesis, there is needed, perhaps, 26 mils of oil per sq. metre of water surface instead of 1/4½ [*sic*] litres as usually recommended. An emulsion makes the spreading much more efficient. It is unfortunate, however, that both larvae and pupae in late autumn were found to be more resistant to the oil than those developed earlier in the summer.

HILL (G. F.). **Relationship of Insects to Parasitic Diseases in Stock.**—*Proc. R. Soc. Victoria, Melbourne*, xxxi, no. 1, December 1918, pp. 11–107, 7 plates. [Received 5th May 1919.]

The first part of this paper deals with the life-history of *Habronema muscae*, which has been known for some years as the result of investigations made in the United States, and with those of *H. microstoma* and *H. megastoma*, nothing concerning which is definitely known in Australia or elsewhere. Such knowledge has become important owing to the belief that the larvae of *Habronema* are the causative agents of disease in the horse, and that splenic and stomach abscesses due to *H. megastoma* have been of more frequent occurrence in Australia during the past few years, the mortality caused in stock under certain conditions being considerable.

As a result of numerous experiments, the details of which are given, it was found that the embryos of *H. muscae* that are passed out in the faeces of the horse, are taken up by the larvae of *Musca domestica*, reared from eggs deposited by adults on them. These remain infective in this respect up to at least 8 days after leaving the rectum, and the fly larvae are known to react to infection when from 48 hours to 9 days old. After a slight amount of development in the faeces, the embryo of *H. muscae* enters the larva of *M. domestica*, where it continues to develop through its various stages until in the adult fly it is ready to develop in the stomach of the horse, where such stages have been met with.

The infection of the horse probably takes place by the ingestion of both living and dead infected flies, it being beyond question that these are quite commonly ingested by horses from drinking troughs and mangers. In summer the fodder is frequented by great numbers

of *Musca domestica* and *Stomoxys calcitrans*, the former predominating, and many of these are doubtless ingested. Attempted experimental infection of *S. calcitrans* with *H. muscae* gave negative results. Other theories of the infection of the horse, by ingestion of the parasite in water or moist material or by ingestion after its escape from the fly whilst feeding upon the mucous membrane of the horse's mouth, have no foundation in fact.

H. microstoma in the adult stage has been known since 1866 as a parasite occurring in the stomach of the horse, but nothing has been known definitely of its life-history. Experiments have shown that *S. calcitrans* is the principal intermediary host of *H. microstoma* and that *M. domestica* only occasionally, possibly only accidentally, acts in this capacity. Fresh horse-faeces are not the usual breeding place of *S. calcitrans*, which frequently, if not generally, breeds in decaying grass, straw and similar matter, and in loose soil contaminated by stable drainage, while the larvae and pupae are commonly found in the older portions of manure heaps.

The embryos of *H. microstoma* passed out in the faeces from the horse are taken up by the larvae of *S. calcitrans* that have oviposited on the faeces, which remain infective in this respect up to at least 15 days, the fly larvae being known to become infected when 2–9 days old, and possibly earlier and later. Development occurs to a slight extent in the faeces and continues in the larval, pupal and adult stages of *S. calcitrans*, which last, either living or dead, is ingested by the horse and thus infects the alimentary canal.

It is yet unproved whether a living *S. calcitrans* infected with *H. microstoma* can infect the definitive host by means of direct inoculation into the skin. In two experiments the negative results obtained may have been due to a clogging of the proboscis by the 15 or 20 parasites present in it, over-infection thus preventing it from properly piercing the skin.

H. megastoma, which has been recorded as the causative agent of tumours in the stomach of the horse, has been shown by experiments to have *M. domestica* as its intermediary host, all available evidence being against *S. calcitrans* acting, even accidentally, in such capacity. The larvae are infected by embryos passed out in the faeces from the horse which remain infective up to 15 days after leaving the rectum. The fly larvae are known to react to infection when from 3–5 days old, and possibly earlier and later. Development continues in the fly in all its stages and is completed in the stomach of the horse, where the larva finds its way into a nodule already formed, or else penetrates the lumen of glands, there setting up the irritation which results in the formation of a new tumour. The adult parasites occur naturally only in tumours, from which they escape after the death of the host, being rarely found on the external surface of the tumour or adjacent membrane. The adults are known to occur also in the splenic abscesses that have become more common of recent years, causing considerable increase of mortality in horses in certain seasons and certain districts in south-eastern Australia. No evidence is forthcoming to show that the larvae of this and the preceding species can enter the fly larvae by penetration or in any way other than by ingestion.

No flies have ever been met with in the stomach of the horse in the

course of experiments, so there is no positive evidence as to whether the larva of the worm is passively liberated by the digestion of the fly, or whether it escapes prior to such digestion, though probably the former is the case. Once freed from the fly-host in the stomach of the horse the larvae of *H. muscae* and *H. microstoma* develop in the stomach contents, and retain their hold by inserting their heads into the mucous membrane, or at least into the lumen of the glands.

The second part of the paper deals with investigations on certain points in the life-history of *Melophagus ovinus*, L. (sheep louse-fly or sheep-tick) undertaken in view of the fact that the enforcement of the Sheep Dipping Act has not had the effect of eradicating this pest. Unlike the true ticks, which leave their host to oviposit, this Hippoboscid fly spends its whole life upon its host, the nearly mature larva being extruded into the wool, where it forms a puparium that is securely attached to the fleece by a glutinous substance. The pupal stage varies according to temperature. On sheep kept in a stall in winter (43° F. to 47° F.) the period was found to be from 22 to 24 days, while in summer (47° F. to 72° F.) it was from 19 to 21 days. Young female flies are capable of pairing 5 days after emergence from the pupae, and the first pupa is extruded 13 to 23 days after emergence, but the length of life of, and the number of pupae extruded by, an individual female have not yet been determined. Pupae appear to be extruded, for a time at least, at an average rate of 1 every 9 days.

The period of viability of *M. ovinus* when removed from the host and kept without food is longer under Southern Australian conditions than those obtaining elsewhere. European and American investigators have stated that it does not live to the 8th day, and that most individuals die in from 2 to 4 days. In Victoria however they were kept alive off the host for $11\frac{3}{4}$ days under cool, uniform conditions in early summer. [See this *Review*, Ser. B, vi, p. 42.] The adult lives longer apart from the host than does either the unfed insect under one day old, or the young insect of 3 to 7 days old that has fed upon the host. The longest period for which an adult female has been kept off the host and without food is up to the 18th day.

Except under extreme temperatures, a certain proportion of the pupae are viable for periods varying up to 42 days after removal from the host. This fact shows that there is some slight ground for the contentions of those sheep owners who maintain that sheep previously freed by dipping may become reinfested from individuals left on grass, bushes or posts, or with those that emerge from pupae dislodged from the fleeces of infested sheep, either by rubbing or by the dipping fluid or heavy rain dissolving the glutinous matter attaching them to the wool. Even under favourable conditions however the numbers that survive for more than 4 or 5 days off the host and subsequently re-infest clean sheep must be extremely small, much too small to account for a general re-infestation of a clean flock or even a moderately large part of it. The author concludes that most of the parasites found on previously dipped sheep are the progeny of pupae extruded prior to dipping, which escaped the destructive action of the fluid. All the sheep used by him experimentally had to be dipped twice, even though strong solutions were used for the first dip, such as cyllin, in the proportion of 2 oz. to 1 gal. water.

Bishopp (F. C.) & Laake (E. W.). U.S. Bur. Entom. **The Dispersion of Flies by Flight.**—*Jl. Econ. Entom., Concord, N.H.*, xii, no. 2, April 1919, pp. 210–211.

In the course of various tests made to ascertain the distance of flight of flies, about 80,000 coloured individuals were released and traps set at varying distances and directions. The results showed that marked house-flies [*Musca domestica*] were taken at a distance of 13 miles; screw-worm flies [*Cochliomyia macellaria*] at 15 miles; *Phormia regina* at 11 miles; and *Ophyra leucostoma* at 7 miles. The following of vehicles by the flies is believed to be an unimportant factor in these experiments. Apparently many favourable feeding and breeding-places were passed in the course of migration.

Parman (D. C.). U.S. Bur. Entom. **Notes on *Phlebotomus* Species attacking Man.**—*Jl. Econ. Entom., Concord, N.H.*, xii, no. 2, April 1919, pp. 211–213.

In 1915 *Phlebotomus* was noticed for the first time attacking man in Texas. The species is unidentified; there have been no previous records of the occurrence of midges of this genus in the south-western States, and *P. vexator*, Coq., the only species known to occur in the United States, has not been recorded to attack man. In Texas this midge appeared in September, October and November; the following year the infestation was greater and appeared a month earlier. The adults always disappear with the occurrence of frosts. During the day they hide in dark places and begin biting about one hour after sundown, but although they will attack in late twilight, they never do so in the dark or in moonlight. The breeding habits are not known but breeding-places are believed to include neglected poultry houses.

It is suggested that the autumn epidemics of dengue fever in 1916 and 1917 and of influenza in 1918 may possibly have been connected with the presence of this midge.

Chapin (E. A.). **New Species of North American Siphonaptera.**—*Bull. Brooklyn Entom. Soc., New York*, xiv, no. 2, April 1919, pp. 49–62.

The classification of the genera *Hoplopsyllus*, *Ctenocephalus* and *Spilopsyllus* is discussed and a key is given to these. The following new species are described: *Hystrichopsylla schefferi*, taken in Washington from the nest of *Aplodontia rufa*; *Stenoponia wetmorei*, taken from *Peromyscus leucopus noveboracensis*; *Myodopsylla subulata*, taken in Connecticut from a bat, *Myotis subulatus*; *Neopsylla similis*, taken in New Mexico from *Peromyscus* sp., in company with numbers of *Ceratophyllus wagneri*, Baker; and *Ceratophyllus utahensis*, from Utah, parasitic on a bird, probably *Steganopus tricolor*.

Rodhain (J.). **Nouvelles Observations sur la Biologie de *Passeromyia heterochaeta*, Villeneuve.**—*Bull. Biol. France et Belgique, Paris*, lii, no. 4, 25th March 1919, pp. 499–510, 2 figs.

The Anthomyid fly, *Passeromyia heterochaeta*, the larva of which is parasitic in birds' nests, is uniformly distributed throughout eastern and central Africa and occurs to a less extent in the basin of the Congo almost to the Atlantic coast. The adult flies were taken near Lake Tanganyika at the end of April together with *Sarcophaga*, *Ochromyia*,

Tricyclea, *Musca* and *Cordylobia anthropophaga* on the Coccid-infested bark of a mulberry tree.

The eggs are laid in small groups directly in the birds' nests close to the host which the larvae will ultimately attack, the fly being attracted by the odour of the inhabited nest and feeding to some extent on the fresh excrement of the nestlings, resembling *Cordylobia* in this habit.

The life-cycle of *P. heterochaeta* from the deposition of the egg to the appearance of the adult occupies 34 to 40 days, and oviposition occurs 11 days after emergence. The incubation period varies from 48 hours to 5 days according to the temperature.

SERGENT (Et.). **Influence du Froid sur le Développement du *Plasmodium relictum* chez le Moustique.** [The Influence of Cold on the Development of *Plasmodium relictum* in the Mosquito.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 4, 9th April 1919, pp. 174–176.

From experiments made with 198 mosquitos to determine the influence of cold as a sterilising agent on the development of *Plasmodium relictum*, the following conclusions have been reached : A temperature of 12°C [54°F.] during the first six hours after an infecting bite does not prevent infection of the insect by the *Plasmodium* ; after the sixth hour the *Plasmodium* may be sterilised, the extreme limit of its resistance at this temperature being three days. The influence of cold is in direct relation to its duration to a degree that is remarkably uniform. This sterilising influence of cold may operate after a preliminary fifteen hours of optimum temperature (20° to 30°C. = 68° to 86°F.), even on the sporozoites that have reached the salivary glands.

FEYTAUD (J.) & GENDRE (E.). **Sur la Répartition des Gîtes d'*Anopheles maculipennis*, Hoffm., et d'*Anopheles bifurcatus*, Meig.** [Concerning the Distribution of the Haunts of *Anopheles maculipennis*, Hoffm., and *Anopheles bifurcatus*, Meig.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 4, 9th April 1919, pp. 178–182.

Very few authors writing on the biology of the mosquitos occurring in France have given any precise indications of the conditions of habitat of the two commonly found species, *Anopheles bifurcatus* and *A. maculipennis*. In the course of investigations in various parts of France, the authors have examined and compared a great number of the haunts of both species. It was found that their habitats differ considerably ; the essential factor influencing their distribution appears to be the temperature of the water, which is itself influenced by the factor of insolation. *A. maculipennis* breeds preferably in stagnant water, when fairly clean and in sunlight, such as clean pools, lakes, marshes, the edges of ponds and rivers, where vegetation is abundant and the temperature variable with exposure to summer heat. This is the species most frequently found in the water of public gardens in the towns of the south-west of France and in the ditches and pools in the country, even when these are more or less dirty. *A. bifurcatus* prefers pure, cold water that is frequently renewed, with but little vegetation. It is found in fresh springs, in shaded streams, covered fountains and wells.

Although the preferred haunts of the two species are different, both may be found in the same environment. The larvae of both species have been taken co-existing in the same stretch of water, while in other

cases one species succeeds and replaces the other according to the season of the year. In May and June 1918, larvae of *A. bifurcatus* were abund nt in Périgord in certain pools and ditches while the water was fresh and frequently renewed, but when it became stagnant and warm puring a long spell of summer weather, only larvae of *A. maculipennis* were found by the month of August. The two species can also exist in adjacent spots, each in its own environment. A striking example of this is seen near Pau where two roads cross at right-angles, one running east and west, the other north and south. A ditch runs along the south side of the one and continues along the east side of the other. In its east-west portion the ditch, shaded from the sun throughout the year by heavy foliage, harbours only *A. bifurcatus*, while in the north-south portion, upon which the sun shines during the greater part of the day, and which is much less cool, only larvae of *A. maculipennis* are to be found.

It seems evident from these observations that although the two species of *Anopheles* commonly found in France sometimes co-exist in the same water, their normal habitats are decidedly different, their distribution being influenced chiefly by the temperature of the water in which they breed, *A. maculipennis* being adapted to warm water, and *A. bifurcatus* to cold. This would explain the earlier development of the latter species in the spring, noticed in various regions, and its extension into mountainous districts such as the Alps and the Pyrenees.

Sergent (Et.). **A Propos de** *Pyretophorus chaudoyei*.—*Bull. Soc. Path. Exot., Paris*, xii, no. 4, 9th April 1919, pp. 182–184.

The presence of *Anopheles* (*Pyretophorus*) *chaudoyei* in the Tell Valley of Kabylia was recorded in 1904 by H. Gros on the determination of F. V. Theobald, but doubt is now expressed as to the correctness of this. The species that has been constantly found in that region is *A. turkhudi* (*P. myzomyifacies*), which also occurs in the Sahara with *A. chaudoyei* and *A.* (*P.*) *sergenti*. The author of the present paper has found *A. chaudoyei* in the Sahara only, where several investigators have studied it, and its occurrence outside this region requires further confirmation.

Buchholtz (M.). **Trench Fever: A Summary from the Literature.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 14, 4th April 1919, pp. 677–681.

This is a general account of trench fever summarised from literature much of which has been previously dealt with in this *Review*.

Marchand (W.). **Collecting the Larvae of** *Tabanus* **and** *Chrysops* **(Dip.).**—*Entom. News, Philadelphia, Pa.*, xxx, no. 5, May 1919, pp. 131–137.

Some particulars are given of the habitat of Tabanid larvae, which are chiefly found in the soft mud immediately adjoining water. The best means of collecting them is to place a lump of mud in an ordinary kitchen strainer with a medium-sized mesh; this should be gently shaken and immersed in water, when the larvae can be easily separated from the mud. Full particulars are given with regard to treatment of larvae to be dispatched for scientific investigation.

FROGGATT (W. W.) & FROGGATT (J. L.). **Sheep-Maggot Flies, No. 4.** —*Dept. Agric. N.S.W., Sydney,* Farmers' Bull. no. 122, December 1918, 24 pp., 4 figs. [Received 16th May 1919.]

The work carried out at the Government sheep-fly experiment station established near Moree, in the north-west, in 1917, is reported upon. Studies on the question of the eradication of the sheep-fly, *Chrysomyia* (*Calliphora*) *rufifacies,* have been continued for the last four and a half years and all indicate that the main solution of the problem lies in the destruction of its breeding-grounds. The blow-flies that cause all the damage to wool and sheep have increased all over Australia owing to the increase of suitable media, such as carcases of dead animals. The obvious remedy for this is to render such material unfit for further development of the maggots, and to kill all maggots and flies on it. This can be done by poisoning it with arsenic water, by burning and by screening [see this *Review,* Ser. B, v, p. 163]. Other methods described for the destruction of the flies include the use of traps for the adults, the most successful of which has been described elsewhere [see this *Review,* Ser. B, vi, p. 74]. Several modifications of this trap are described and their merits discussed. A hundred or more of these traps should be used by each sheep-owner, and each one can catch some hundreds of thousands of flies. Poisoning the bait within the traps is considered unnecessary, as the flies caught can easily be destroyed by passing a flare of burning paper over the gauze top. Various baits for the traps were compared and tested; a mixture of fermented yeast and water gave very variable results, attracting swarms of flies on some days and on others apparently proving no attraction. Further tests with baits are in preparation. Spraying sheep as a preventive against infestation has not given good results, the sprayed sheep being no more immune from flies than the untreated ones. Sheep that have been blown should have all infested or damaged wool shorn off the skin, and then a dressing applied with a swab over the infested area. Mixtures that have given good results in this treatment include spirits of tar 1 pint, and kerosene about 5 pints; 1½ lb. sodium arsenite dissolved in 50 or more gals. water; 1 pint turpentine to 5 pints castor-oil, and bluestone solution. The last-named is not recommended owing to its staining and hardening the skin. The value of dipping and spraying [see this *Review,* Ser. B, v, p. 165] is doubtful, and in all cases the effects last only a short time.

The breeding and distribution of the Chalcid, *Nasonia brevicornis* on a large scale and the study of the other natural parasites proceeds steadily [see this *Review,* Ser. B, vii, p. 100]. In response to requests from many sheep-owners, simple instructions are given for the breeding of *N. brevicornis* and its liberation.

The season of 1918 was remarkable for the comparative absence of blow-flies among sheep, and for the rapidity with which blown sheep recovered. Flies responsible for the blowing of sheep during the year and captured in traps included *Pollenia* (*Calliphora*) *villosa* (golden-haired blow-fly), which was absent from October 1917 to April 1918, and *Anastellorhina augur* (*Calliphora oceaniae*) (smaller yellow house blow-fly), which disappeared in February and early March. *Lucilia sericata* (English sheep-fly) was in evidence throughout the year. *Chrysomyia* (*Calliphora*) *rufifacies* and *C. varipes* appeared in mid-October and disappeared in early April.

Bonain (—.). **Dératisation et Désinfection des Locaux de petites Dimensions.**—*Arch. Méd. et Pharm. Navales, Paris,* cv, no. 3, March 1918, pp. 215–223, 1 fig.

The use of liquid sulphurous anhydride is recommended for fumigating small spaces and a suitable apparatus has been built to the author's specification. This consists of a metal cylinder provided with a screw tap and removable union connected with a tube which is passed through a key-hole or other suitable aperture into the space to be fumigated. The cylinder has an internal diameter of 70 mm. and a height of 300 mm. After allowing 1/5 volume for the expansion that will take place if the apparatus be stored in a warm place the contents should be 1,290 grams of sulphurous anhydride, this being sufficient to disinfect a space of 18 cub. metres [630 cub. ft.] which is that of an average ship's cabin. The liquid is converted into gas in about 5 minutes and the gas must be allowed to act for about 2 hours in order to destroy rats ; insects require a longer period.

Galli-Valerio (B.) & Stalder (H.). **La Piroplasmiase des Bovidés en Suisse.**—*Schweiz. Archiv. f. Tierheilkunde, Zürich,* lx, no. 10, October 1918, pp. 471–477, 1 fig.

A few cases, observed by Stalder since 1912, of acute anaemia accompanied by severe haemoglobinuria among the milch cows of the Cossonay district (Canton of Vaud) are the first recorded cases of bovine piroplasmosis in Switzerland. The species of *Piroplasma* concerned has not been determined, but is possibly *P. divergens.* The tick, *Ixodes ricinus,* is very common in the district, *I. hexagonus* being more rare, and the former is probably the intermediate host.

Velu (H.). **Une Trypanosomiase du Cheval au Maroc. Etude clinique et experimentale.**—*Rev. Gén. Méd. Vétérinaire, Toulouse,* xxvii, no. 322, 15th October 1918, pp. 489-513.

During the year ended August 1917 the author studied an outbreak of trypanosomiasis among the horses of a native cavalry unit in Morocco caused by a dimorphic trypanosome, which was probably transmitted by Tabanids and occurred only at the foot of the Atlas range. The prophylactic measures mentioned include the isolation or slaughter of diseased animals and the avoidance of places infested by the flies.

Di Domizio (G.). **Una Tripanosomiasi del Dromedario eritreo (Gudhò). Cenni sulle Mosche ematofage della Colonia Eritrea.** [A Trypanosomiasis (Gudhò) of Eritrean Camels. Notes on the Blood-sucking Flies of the Colony of Eritrea.]—*Clinica Veterinaria, Milan,* no. 16–17, 31st August–15th September 1918, pp. 391–413. (Abstract in *Trop. Vet. Bull., London,* vi, no. 4, 30th December 1918, p. 221.)

The first part of this paper reviews published observations, especially those of Martoglio [see this *Review,* Ser. B, i, p. 181], who stated that the bovine trypanosomiasis known as " jahan " in Eritrea occurs in camels under the name of " gudho." The author records his own

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observations on this disease, which occurs in the low-lying or moderately elevated districts, except in the pastures quite close to the Red Sea. The losses are most severe on the mountain slopes facing the sea, where blood-sucking flies are most numerous. In the interior of the Colony losses are rare. The incubation period lasts 3–4 months and the first symptoms are a gradual loss of condition, slight intermittent fever and lachrymation without ocular lesions. The appetite usually remains unimpaired. Diarrhoea may set in before death. There are no appreciable oedematous swellings and the excretory system is not disturbed. The disease lasts from 6 months to 2 years. Death occurs, owing to extreme debility, in most cases. Recovery requires a long convalescence and apparently results in a lasting immunity. Camel-owners avoid fly-infested localities and consequently the disease does not appear to spread. A list of the blood-sucking flies of Eritrea has been given by Ferraro [see this *Review*, Ser. B, v, 176]. This paper deals very fully with their distribution. All these species are capable of transmitting the disease mechanically, but the most deadly localities for camels are not those infested by *Stomoxys*, but those where *Pangonia* and *Tabanus* occur, especially the latter.

Cominotti (L.) & Di Domizio (G.). **L'Emoglobinuria dei Bovini delle Regioni prealpine è una Piroplasmosi. Nota preventiva.** [The Haemoglobinuria in the Cisalpine Districts (of Italy) is a Piroplasmosis. Preliminary Note.]—*Clinica Veterinaria, Milan*, no. 16–17, 31st August–15th September 1918, pp. 425–430. (Abstract in *Trop. Vet. Bull., London*, vi, no. 4, 30th December 1918, p. 227.)

It is probable that the acute form of red water in cattle which occurs perhaps throughout the whole of the cisalpine districts of Northern Italy is due to a species of *Piroplasma* which is believed to be distinct from *P. bigeminum*. The tick, *Boophilus* (*Margaropus*) *annulatus*, is said to be common in the districts in question.

Teichmann (E.). i. **Bekämpfung der Stechmücken durch Blausäure.** [Combating Mosquitos with Hydrocyanic Acid.]—*Zeitschr. f. Hyg. u. Infektionskrankh., Leipsic*, lxxxv, no. 1, 1st February 1918, pp. 1–16.

ii. **Bekämpfung der Stechmücken durch Blausäure. II. Die Anwendung des Verfahrens auf die Brut der Stechmücken.** [The Application of the Hydrocyanic Acid Method to Mosquito Breeding-Places.]—*Ibid.*, lxxxvi, no. 1, 2nd May 1918, pp. 35–51. (Abstracts in *Trop. Dis. Bull., London*, xiii, no. 1, 15th January 1919, p. 48.)

An account of experiments with *Culex* has already been noticed [see this *Review*, Ser. B, vi, p. 57]. In testing the effect of hydrocyanic acid on Anophelines, which are numerous in September in Wurtemburg, 150 *Anopheles bifurcatus* were submitted to the action of the dilute gas and were found to succumb as readily as *Culex*. It was not necessary to make the room air-tight.

In the second paper the fact is recorded that mosquito larvae can be killed by the presence of the gas above the water-surface or by dissolving sodium cyanide in the water. A freshly prepared 1 in 100,000 solution in water destroys all the larvae and pupae contained therein

in 24 hours ; the gas which is formed soon diffuses into the air. The opportunities for the employment of this method are however very limited.

In a note the Editor of the *Tropical Diseases Bulletin* points out that in 1911 Ross and Edie found that potassium cyanide in water, 1 in 300,000, was effective experimentally, larvae of *Culex* and *Anopheles* being killed by it. It was mixed with floating soap and the whole compressed into tablets. The method was tried in Ceylon, but a strength of 1 in 37,000 was found to be required, and this concentration was considered to be risky.

Russell (F. F.). **Summary and Discussion of the Work performed at the Board of Health Laboratory during the Calendar Year 1916.** —*Proc. Med. Assoc. Isthmian Canal Zone*, x, no. 1, January–June 1917, pp. 7–25. Published by the Panama Canal Health Dept.

A table shows the numbers of the various species of mosquitos captured in different parts of the Isthmus of Panama during the year. *Taeniorhynchus* (*Mansonia*) *titillans* accounted for 242,900 out of a total of 391,300. The other figures were: *Anopheles albimanus* 55,365 ; *A. tarsimaculatus* 3,813 ; *A. argyrotarsis* 4 ; *A. pseudopunctipennis* 45 ; *A. apicimacula* 19 ; *A. malefactor* 114 ; *Taeniorhynchus* (*Mansonia*) *fasciolatus* 265 ; *T.* (*M.*) *nigricans* 67 ; *Ochlerotatus* (*Aëdes*) *taeniorhynchus* 2,154 ; *Aëdomyia squamipennis* [45] ; *Lutzia allostigma* 3 ; *Stegomyia fasciata* (*calopus*) 2,068 ; *Culex* and allied genera 76,145 ; *Wyeomyia* 990 ; *Lesticocampa* 62 ; *Psorophora* 35 ; *Deinocerites* 36 ; *Sabethes* 1 ; *Joblotia* 11 ; *Haemagogus* 3 ; and damaged *Anopheles* 7,155.

Much information is given regarding the plant, *Pistia stratiotes*, attached to which *T. titillans* passes its entire larva and pupal life beneath the surface of the water. The breathing tubes of both larva and pupa are so modified as to be able to pierce the rootlets of *P. stratiotes* and obtain oxygen direct from the plant. Its roots are sometimes several feet in length and they hang straight downward in the water with a quantity of decayed vegetable matter and débris attached to them. In this mass of filamentous rootlets the larvae and pupae of *T. titillans* are to be found. A negative result attended the one test made to determine if this mosquito could transmit dengue fever.

Observations on the biology of *Dermatobia cyaniventris* showed that half-grown larvae could be successfully transplanted from one animal to another. The iguana tick, *Amblyomma dissimile*, was found on *Iguana tuberculata*, on 70 per cent. of the snakes recorded, and on 90 per cent. of the toads.

Hirst (S.). **Studies on Acari. No. 1. The Genus *Demodex*, Owen.**— *Brit. Mus. Nat. His., London*, 1919, 44 pp., 13 plates, 4 figs. Price 10*s*.

The species of the genus *Demodex* may be present without causing any inconvenience to their host and they have been frequently found on perfectly healthy animals. *D. folliculorum* has been met with in man without causing disease. Gmeiner is of opinion that these mites occur in the skin of practically every human being, and although not the actual cause of disease they are considered amongst the possible transmitters of leprosy and other skin infections.

The most serious disease with which *Demodex* has been connected is follicular or red mange of dogs, which is caused by *Staphylococcus pyogenes albus*, and the symptoms and treatment of which are discussed. Mites of this genus have also been found in connection with skin disease of cats, horses, cattle, pigs and goats. Little is known of the habits of these parasites, but infection is probably due to actual contact of infested animals with others of their species. They may attach themselves to active ectoparasites as a means of dispersal. All stages have been found to be present together in one follicle. A list of the species and varieties of this genus with their hosts and known distribution is given.

McAtee (W. L.) & Walton (W. R.). **District of Columbia Diptera: Tabanidae.**—*Proc. Entom. Soc. Washington, D.C.*, xx, no. 9, December 1918, pp. 188–206, 2 figs. [Received 21st May 1919.]

The number of species given in this list of Tabanids occurring in the District of Columbia is 54. The larvae of most of them live in water or wet soil and the adults are found in the greatest abundance in well-watered situations. Keys are given to the genera and species contained in the list and a comparison is made between the species found in the district of Columbia and those of New Jersey. A species closely allied to *Chrysops*, but differing markedly from it in habitus as well as certain structural characters, is described as *Neochrysops globosus*, gen. et sp. nov.

Parker (R. R.) & Wells (R. W.). **Observations on and Experiments with *Cuterebra tenebrosa*, Coquillet.**—*Jl. Parasitology, Urbana, Ill.*, v, no. 3, March 1919, pp. 100–104, 1 plate.

During investigations of large numbers of rodents as possible hosts of *Dermacentor venustus*, Banks, a pack rat (*Neotoma cinerea*) and a grasshopper mouse (*Onychonomys leucogaster missouriensis*) were found infested with larvae of *Cuterebra tenebrosa*, Coq. (rodent botfly). A female fly in captivity deposited 186 eggs, and the larvae reared from these were used for experimental infestations of prairie dogs, Belgian hares and ground squirrels. In the case of the two latter, negative results were obtained. Full particulars of each experiment are given. The effect of the presence of the larvae on the prairie dog is very slight.

Frey (J. J.). **Problems in Anthrax Control.**—*Jl. American Vet. Med. Assoc., Baton Rouge, La.*, lv, (N.S. viii), no. 2, May 1919, pp. 192–198.

In this paper suitable vaccines and their application to cattle infected with anthrax are discussed. *Tabanus atratus* is considered to be responsible to a large extent for the transmission of the bacilli. Other flies and mosquitos are probably concerned to a less extent. All carcases should be immediately cremated to prevent the spread of the disease.

Bodkin (G. E.). **Report of Economic Biologist.**—*Brit. Guiana Dept. Sci. & Agric., Rept. for the Year 1917, Georgetown,* 8th May 1919, 14 pp. [Received 24th May 1919.]

The following blood-sucking parasites are additional to those previously recorded [see this *Review* Ser. B, v, p. 4]:—Ixodids, *Amblyomma naponense*, Pack., found on wild hog (*Dicotyles torquatus*) and *A. fossum*, Neum., taken on man in the forest area; Tabanids, *Selasoma tibiale*, F., and *Pangonia* (*Erephopsis*) sp.; Hippoboscids, *Stilbometopa podostyla*, Speis., found on a pigeon (*Leptotila verreauxi*) and *Pseudolfersia vulturis* on a vulture (*Cathartes uruba*); Pulicids, *Xenopsylla cheopis*, Roth., on rats, and *Rhopalopsyllus lugubris*, Roth., and *R. australis*, Roth., on *Myoprocta acouchi*.

Brunetti (E.). **Review of Progress in our Knowledge of Oriental Diptera during the last two Decades.**—*Proc. Asiatic Soc. Bengal, Calcutta,* xiv, no. 9, April 1919, pp. 358–371.

The Diptera of economic importance referred to in this paper include a number of Simuliidae, some species of which bite viciously, especially in the hills, where they are sometimes fairly common. *S. indicum*, Becker, the first species to be described from Assam, is probably the commonest, while *S. striatum*, Brunn., occurs as far south as Ceylon, and *S. nobile*, Meij., in Java. Some 360 species of Oriental Culicidae have been recorded, though these are probably not all valid. Comparatively few additions have been made to the knowledge of the family Tabanidae, which is abundantly represented, close on 200 species having been catalogued.

In the small family Oestridae, the species known in 1896 have not been added to. About 20 Oriental species of Muscinae have been recorded, though some appear to require corroboration. The common European dung fly, *Scatophaga stercoraria*, L., has not previously been recorded from the East, though it has been found quite commonly by the author in Mussoorie and Darjiling. About a dozen species of Hippoboscidae and eight Nycteribiidae have recently been described.

The Construction of Dipping Tanks for Cattle.—*Rhodesia Agric. Jl., Salisbury,* xvi, no. 2, April 1919, pp. 131–139.

Drawings and descriptions are given for guidance in the erection and use of dipping tanks, and while these may be taken as generally applicable, they are meant to serve only as an indication of dimensions, specifications and accessory requisites of a serviceable and economical dipping tank and are subject to modification to suit individual ideas and circumstances. A schedule gives the approximate capacities of a tank built to the dimensions shown on the drawing and many hints on dipping and the maintenance of the strength of the dip are included.

Sinclair (J. M.). **Management of Dipping Tanks.**—*Rhodesia Agric. Jl., Salisbury,* xvi, no. 2, April 1919, pp. 139–141.

Notes are given on the management of the dipping solution and dipping tanks generally, which it is hoped will be of assistance to stock owners, particularly in the matter of maintaining the exact strength of the liquid in the tanks [see this *Review*, Ser. B, vi, p. 218].

GRIFFITTS (T. H. D.). **Winter Hibernation of Anopheles Larvae.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiii, no. 46, 15th November 1918, pp. 1996–1998.

Observations of the author and others on the winter hibernation of American species of *Anopheles* has led to the conclusion that *A. crucians* and *A. punctipennis*, at least, pass the winter in the larval stage. Pupation does not apparently take place until ordinary room temperature occurs. An ice-covered pool that was searched for larvae in the morning without success showed many individuals in the afternoon, when the sun had warmed the pool and had evidently caused them to rise. Larvae of *A. crucians* taken from a pool on 22nd February and put in room temperature pupated and emerged as adults on the fourth day. Larvicides should therefore be applied in the autumn sufficiently late to kill the last batch of larvae, or before the season suitable for the completion of their aquatic stages in the spring.

LENTZ (W.). **Hühnerspirillose in Serbien.** [Spirillosis of Fowls in Serbia.]—*Centralbl. Bakt., Parasit. u. Infektionskr., Ite. Abt. Orig. Jena*, lxxxii, no. 3–4, 11th November 1918, pp. 303–304, 1 fig.

This is brief record of observations on fowl spirillosis as observed in Serbia in 1918. A remarkable fact was that the disease occurred in what was a severe winter for the country. The cold weather was broken by a warm spell lasting 14 days and the affected fowls were allowed to run on a wet meadow and were then probably exposed to the infection transmitted by the tick, *Argas persicus* (*miniatus*).

VRIJBURG (A.). **Babesiose en Babesiaparasieten in Nederland.** [Babesiasis and Babesia Parasites in Holland.]—Reprint from *Tijds. v. Diergeneesk*, xlv, nos. 19–20, 1st and 15th October 1918, 33 pp., 4 plates. (Abstract in *Trop. Vet. Bull., London*, vii, no. 1, 30th March 1919, pp. 14–15.)

Little new information on the pathology of redwater in cattle in various parts of the world is here given. Observations are recorded on the life-cycle of *Ixodes ricinus*, which is apparently the vector of redwater in cattle in Holland. The female tick was able to lay eggs when kept a very few degrees above freezing-point, but at this temperature only a few larvae emerged after 8 months. After storage for 6 months at this temperature and subsequent exposure to a changeable winter temperature the eggs were killed. Engorged larvae were found to remain alive for more than 10 months. At room temperature the fully engorged females oviposited after 18 days and larvae hatched 46 days later. Larvae were hatched from eggs kept at outside temperatures after 59 days. *Piroplasma* (*Babesia*) *bovis* appears to be the parasite causing redwater of cattle in Holland. The author agrees with Nuttall that the name *P.* (*Babesia*) *divergens* should be sunk, and that *P.* (*B.*) *bigeminum* should be retained for the Texas fever parasite and *P.* (*B.*) *bovis* for the European one.

Pricolo (A.) & Ferraro (G.). **Circa il Tripanosoma del Camello della Colonia Eritrea.** [The Camel Trypanosomiasis occurring in Eritrea.]—*Clinica Veterinaria, Milan*, no. 20–21, 31st October–15th November 1918, pp. 522–524.

It is stated that the trypanosome found in Eritrean camels is *Trypanosoma evansi* and is identical with that occurring in other parts of North Africa, there being no appreciable difference in morphology, pathogenicity for various animals, transmission by flies other than *Glossina* or clinical symptoms in affected animals.

Bardelli (P.). **La Rogna sarcoptica negli Equini militari.** [Sarcoptic Mange in Army Equines.]—*Clinica Veterinaria, Milan*, no. 20–21, 31st October–15th November 1918, pp. 524–555.

This paper reviews the available information as to the various methods of combating mange in horses, mules and donkeys, due to *Sarcoptes scabiei* var. *equi*. The biology of this mite is dealt with briefly.

Rivas (D.). **Diagnostic Method, Treatment and Prophylaxis of Malaria as conducted in the Sanitation of Brioni, Istrie (Austria), in 1899 to 1902.**—*New Orleans Med. & Surg. Jl., New Orleans*, lxxi, no. 7, January 1919, pp. 322–335, 5 figs.

The financial value of anti-malarial work on the Island of Brioni, in the Adriatic off the coast of Istria, is emphasised. Known as the "Island of the Dead," it was purchased in 1880 for £8,000 and in 1902, after it had been officially declared free from malaria, it was valued at £200,000. The methods employed are described.

Councilman (W. T.) & Lambert (R. A.). **The Medical Report of the Rice Expedition to Brazil.** From the School of Tropical Medicine, Harvard University.—Cambridge, Mass.: Harvard Univ. Press. London: Humphrey Milford. Oxford Univ. Press. 1918. vi + 126 pp., 35 figs. Price 5*s.* 6*d.*

In the chapter dealing with insects noxious to man in the Amazon region, an account is given of ants and other biting insects. The pium, a small biting fly, which is most troublesome, is confined to the banks of rivers. No typical ulcers due to *Leishmania* were found in the natives in the regions where these flies were most abundant. Even more dreaded are minute orange Trombidiid mites, against which clothing affords no protection. The common house-fly [*Musca domestica*] appears to be absent, nor do carrion flies seem to occur. Mosquitos were practically absent save on one or two occasions.

Macdonald (A.). **Antimalarial Measures in England.**—*Brit. Med. Jl., London*, no. 3048, 31st May 1919, pp. 669–670.

A brief summary of a record to be published for the War Office of the occurrence and control of malaria, imported and indigenous in England, enumerates the general anti-malarial, anti-larval and anti-mosquito measures adopted.

The latter measures were carried out mainly in the "dangerous areas," Sheppey, Sandwich, and Romney Marsh. *Anopheles maculipennis* is the main domestic danger in England, wintering where the conditions obtainable are warmth, freedom from draught and disturbance, shade and food, such as in buildings where cattle and other domestic animals are housed, and during summer in human dwellings. Stables, cowsheds, and pig-sties, by means of repeated operations, including the destruction of cobwebs and whitewashing, have been cleared of mosquitos in winter, those not actually destroyed being unable to withstand the winter temperatures outside. Where "myriads" were recorded on 4th March 1918, 6 were found with difficulty on 4th March 1919. In districts under observation, but where no measures were taken, the prevalence of *A. maculipennis* in 1917, 1918 and 1919 has not varied.

Prevention of larval development in Sandwich has entailed operations on notoriously infested waters together with the maintenance of more than 20 miles of dykes drained and free from weeds, all this being within the camp area and in intimate relation to an aggregation of some 30,000 men, harbouring a carrier volume not readily ascertainable. The result of these combined operations has been a rarity of *A. maculipennis* within military quarters, absence of larvae from treated dykes, and a record of 6 indigenous cases in 1918 as against 69 in 1917, these 6 resulting in a local defect in detail. In Sheppey, where such thorough measures could not be carried out, the reduction has been from 68 to 34 military cases, and from 35 to 14 among civilians.

Mosquito prevalence and conditions for indigenous infection similarly existed both in 1917 and 1918, but the carrier population was increased in 1918. Where general measures were adopted, but when control was more accurate, the scattered occurrences were 26 in 1917 and 24 in 1918. Where sanitary measures were added to the scheme of prevention, as in Sheppey, the cases were reduced from 103 in 1917 to 45 in 1918.

WASHBURN (F. L.) & HOWARD (C. W.). **Household Insects.**—*Office of Minnesota State Entomologist, Univ. Farm, St. Paul*, Circ. no. 44, 15th October 1917, 14 pp., 7 figs., 1 plate. [Received 28th May 1919.]

This paper, which is compiled from previous circulars, includes the usual measures for dealing with bed-bugs and fleas.

MACFIE (J. W. S.). **Two Parasites of *Naja nigricollis*.**—*Ann. Trop. Med. Parasit., Liverpool*, xiii, no. 1, 12th May 1919, pp. 23–30, 1 plate.

Trypanosoma voltariae, sp. n., and *Plasmodium mesnili*, Bouet, both found in the blood of a snake, *Naja nigricollis*, in the Gold Coast, are described.

EVANS (A. M.). **On the Genital Armature of the Female Tsetse-flies (*Glossina*).**—*Ann. Trop. Med. Parasit., Liverpool*, xiii, no. 1, 12th May 1919, pp. 31–56, 18 figs.

This paper contains a general account of the morphology of the female armature of the tsetse-flies with a description of the technique

employed. A table for distinguishing on these characters the three groups as represented by *G. morsitans*, *G. fusca* and *G. palpalis* is given, with a key to the species in the *G. fusca* group. A comparison is made between the external female armature of *G. fusca* and *Calliphora erythrocephala*.

G. submorsitans, Newst., *G. pallidipes*, Aust., and *G. longipalpis*, Wied., were examined, but do not exhibit any marked features distinguishing their armature from that of *G. morsitans*.

Brain (C. K.). **Report on Typhus Conditions in Native Dwellings.**—*Union S. Africa, Dept. Agric., Pretoria*, Loc. Ser. 57, 1919, 20 pp. 6 figs.

Owing to the prevalence of typhus among South African natives there is urgent need for far greater attention being paid to the conditions under which they live in the proximity of Europeans.

The conclusions arrived at from an inspection of native dwellings are that the body-louse, *Pediculus humanus*, is the most important if not sole means of conveying the infection. When a locality is freed from this vermin the disease disappears. Typhus is more prevalent in the winter owing to crowding indoors for warmth, which facilitates the rapid migration of lice from one person to another. Bed-bugs, fleas, flies and mosquitos do not exhibit any connection with the transmission of the disease. The abundance of lice and other insect vermin is closely associated with unwholesome conditions of native dwellings and their surroundings, so that a serious effort should be made to improve this state of affairs. It is suggested that heat should be used for the treatment of blankets and clothing but repeated application is essential. Neat paraffin is recommended as a dressing for the head followed by soap and water to eliminate the danger from fire.

Walden (B. H.). **Mosquito Work in 1918.**—*18th Rept. Connecticut State Entomologist for 1918, Conn. Agric. Expt. Sta., New Haven*, Bull. no. 211, 1919, pp. 337–340. [Received 5th June 1919.]

No new mosquito work was carried out during the year. The severe storm occurring in the autumn of 1917 caused much damage to existing structures, and owing to the scarcity of labour only such work as was absolutely necessary was done in order to maintain the former constructions in good repair and working order. Details of this work carried out in various localities are given.

Townsend (C. H. T.). **Oviposition of *Rhinogastrophilus nasalis*, L.**—*Canadian Entomologist, London, Ont.*, li, no. 5, May 1919, p. 120.

Referring to a criticism of a note on the oviposition of *Gastrophilus* (*Rhinogastrophilus*) *nasalis*, L. [see this *Review*, Ser. B, vii, p. 58], the author insists that his observations [see this *Review*, Ser. B, vi, p. 189] are absolutely correct. He remarks: "In repeated instances I saw the fly strike at the muzzle of the horse just as I have described. While the egg of *nasalis* is easily to be distinguished from that of *intestinalis*, I still maintain that both are practically the same size

and shape as compared with that of *haemorrhoidalis*. I also still believe that my tentative conclusions as to the method of oviposition are extremely probable. As to the observations recorded, they are not inaccurate in any sense."

CLEARE (L. D.). **Mosquitoes: How they live, how they spread Disease, and how to destroy them.**—*Jl. Brit. Guiana Bd. Agric., Georgetown*, xii, no. 1, January 1919, pp. 19-35, 8 figs. [Received 5th June 1919.]

This popular paper, compiled largely from recent literature on the subject, gives a general account of the commoner mosquitos, their connection with disease and recommendations for their control. Species of *Culex*, *Anopheles* and *Stegomyia* are abundant in British Guiana and two of the diseases carried by them, malaria and filaria, are prevalent. No outbreak of yellow fever has occurred in the Colony since 1885, though its transmitter, *Stegomyia fasciata*, is probably the commonest mosquito in Georgetown and is important in view of the possible re-introduction of the disease. Malaria was the cause of 1,436 deaths in the Colony in 1917, or 15·1 per cent. of all the deaths, as well as a great deal of illness and loss of labour. While the number of deaths caused by filariasis is not so large, some 13 to 15 per cent. of the native population and about 25 per cent. of the primary school children in Georgetown have been found to be suffering from it.

D'EMMEREZ DE CHARMOY (D.). **Poultry in Mauritius: Their Diseases, Breeding and General Management.**—*Mauritius Dept. Agric., Port Louis*, Bull. no. 12, December 1918, pp. 26–28, 1 plate. [Received 10th June 1912.]

The external parasites causing disease among poultry in Mauritius include the mites, *Sarcoptes mutans* and *Dermanyssus* sp., and lice such as *Goniocotes abdominalis*. An important pest of ducks is a large Acarid, *Hylothyrus coccinella*, which lives in shady and moist places under stones and vegetable refuse. A volatile substance with a very penetrating odour which acts on the nasal tissues exudes from it. Contact of the insect with the mucus membrane of the mouth causes violent imflammation, usually ending in death after a few hours, and the rearing of ducks is impossible in localities where this Acarid abounds.

VELU (H.). **Trypanosomiase des Chevaux du Maroc. Guérison de la Maladie expérimentale du Chien par l'Osarsan.** [Trypanosomiasis of Horses in Morocco. Experimental Cure of the Disease in Dogs by Osarsan.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 5, 14th May 1919, 220–223.

Experiments, which are described in detail, have led to the conclusion that *Trypanosoma marocanum* is susceptible to a series of injections of osarsan in strong doses. A dog can stand doses of 1/10 grams per 1000 grams, repeated at 7 to 9 days' interval. Prolonged observation alone will determine the value of this drug as producing a definite cure.

Feytaud (J.) & Gendre (E.). **Sur la Résistance des Larves de Culicides dans les Eaux picriquées.**—*Bull. Soc. Path. Exot., Paris*, xii, no. 5, 14th May 1919, pp. 231–234.

One of the authors, visiting a melinite factory in July 1918, was surprised to find Anophelines breeding in water heavily tainted with sludge from the factory. The brown tinge of the water made it appear unlikely to harbour any fauna, while it had been considered certain that the presence of the sediment in the water would prevent Anophelines from breeding and would be, in fact, a guarantee against any possibility of the presence of malaria. Having discovered the possibility of breeding in such media, experiments were undertaken to determine the resistance of the larvae in solutions of picric acid at various degrees of concentration, and to work out a suitable treatment for the reservoirs in melinite factories. A solution of 1 part picric acid in 80 parts water was chosen and this was used in varying dilutions on larvae of *Anopheles bifurcatus*, *A. maculipennis*, *Culex pipiens* and *Theobaldia* (*C.*) *annulata*. *A. maculipennis* can withstand a stronger solution than *A. bifurcatus*, the larvae apparently being scarcely inconvenienced by dilutions stronger than 1/500. The larvae of *Culex* are more resistant and lived for several days in a dilution of 1/50. It is quite probable that the resistance is greater when the larvae, instead of being plunged suddenly into a picric solution, develop in this medium from their birth, and they can certainly stand a greater strength when it is added gradually. It was noticed that all the larvae of *A. maculipennis* recovered from the tainted water of the factory were small in size, indicating perhaps that the majority of them die before reaching maturity, or it may be that metamorphosis is accelerated owing to the unfavourable medium. It is possible that in time a dwarf race might develop which would be still more resistant. As regards the poisonous effect of picric acid alone, without reckoning any other substance present in the sediment, it is necessary to use at least one part of pure picric acid to 8,000 parts of water.

Schwetz (J.). **L'Identité des Conditions géo-botaniques des Gîtes à Pupes de la *Gl. palpalis*, de la *Gl. fusca*, de la *Gl. brevipalpis*, de la *Gl. pallidipes*, et de la *Gl. morsitans*.**—*Bull. Soc. Path. Exot., Paris*, xii, no. 5, 14th May 1919, pp. 234–238.

While some records have been published of the haunts of the pupae of *Glossina palpalis* and of *G. morsitans*, very little seems to be known about the favourite breeding-places of *G. brevipalpis*, *G. pallidipes* and *G. fusca*. The author has been studying these five species during 1916–1918 in the north of the province of Katanga (Belgian Congo), and gives a preliminary résumé of his observations. Pupae of two and even three species have been found together, indicating that identical or very similar spots are chosen for the deposition of larvae. The absolutely essential conditions for pupae of all species of *Glossina* are (1) dry, loose soil, and (2) shade. Local conditions force the flies to a certain adaptation, and thus a difference appears to exist at first glance between the breeding-places of various species. But this apparent difference is due only to the fact that the various species choose their habitat with a view to the special vegetation necessary to them. *G. palpalis* breeds on the wooded banks of waterways

and it is in favourable spots on these banks that the pupae are found, wherever possible in pure sand or otherwise in sand mixed with earth, or in soil only, provided that it is sufficiently loose. When the wooded belts beside rivers or streams are inhabited by *G. brevipalpis* or by *G. fusca*, their pupae are found in similar situations to those of *G. palpalis*, and may even occur with them. *G. morsitans*, while it does not avoid the neighbourhood of water if the foliage is not too dense, generally prefers a large area of moderately wooded land, even without water, and the same may be said of *G. pallidipes*. *G. brevipalpis*, while preferring the forest belts beside the rivers, adapts itself also to the haunts of *G. morsitans* and *G. pallidipes*. *G. fusca* inhabits only large tracts of forest and does not seek water. Isolated individuals or groups of pupae may at any time be found under any favourable conditions, but there are certain preferred positions where they are most surely to be found. These are large trunks of felled or uprooted trees lying horizontally or slightly obliquely, whether living or dead. Low-growing vegetation also has some influence on the choice of breeding-places. It must not be too dense or the fly cannot find a suitable spot owing to the numerous small roots binding the soil together, and it must not be absent because, although sufficient shade might be provided by surrounding trees, the flies would not have the necessary support at the moment of expulsion of the larvae. Pupae have, however, occurred without vegetation where the branches of trees are sufficiently near to the ground, and have also been found on the ground itself, immediately under dead leaves.

VAN DEN EECKHOUT (M. A.). **Du Traitement de la Gale sarcoptique chez le Cheval.** [Treatment of Sarcoptic Mange in Horses.]—*Ann. Méd. Vét., Brussels*, lxiv, no. 3–4, March–April 1919, pp. 112–115. [Received 23rd June 1919.]

Mange in horses is communicated directly by contact with infected animals or indirectly by contact with harness, vehicles and other objects that have been in close proximity to infested animals. These should be treated with milk of lime, which can be used for stable walls, etc., and concentrated creoline solution for harness and objects that are too valuable to burn.

The life-history of the mite [*Sarcoptes scabiei equi*] is briefly given. The treatment recommended as being efficacious, as well as easily applied, is the rubbing in by means of a hard brush, so as to penetrate through the skin into the burrows of the following ointment: carbonate of soda, water, brown soap, sulphur and creoline one part by volume of each. The carbonate of soda is dissolved in water and the other ingredients added in the above order to form a liquid paste. Before use the paste should be well stirred and diluted with 5 parts by volume of water.

Each treatment should be continued for about half an hour, after which the horse should be well washed down with clean water and dried. The treatment should be repeated 4 times at intervals of 3 to 4 days.

One of the advantages of this treatment is that it does not cause shedding of the coat.

LEGER (M.) & VIENNE (M.). **Epizootie à Trypanosomes chez les Bovidés de la Guyane française.** [An Epizootic caused by Trypanosomes in Cattle in French Guiana.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 5, 14th May 1919, pp. 258–266.

Several diseases due to trypanosomes are known to occur in South America. Mal de caderas, caused by *Trypanosoma equinum*, a disease in Venezuela due to *T. venezuelense*, a trypanosomiasis of mules imported from the United States to Panama in 1910, caused by *T. hippicum*, and dourine, caused by *T. equiperdum*, all occur naturally in horses, but no epizootic caused by these flagellates has hitherto been known in cattle in South America. The present paper describes a disease of this kind occurring in a village in French Guiana, which is said to have broken out in July and August 1918, though, in view of the slow nature of the disease, it is probable that it started unnoticed at the end of 1917. It has been impossible to trace the source of importation of the trypanosome into the village in question. The symptoms of the disease are discussed and may be described as a progressive anaemia, developing very slowly and almost always terminating fatally. Certain symptoms frequently found in other forms of trypanosomiasis are entirely absent, such as keratitis and ophthalmia, precocious paralysis of the hind quarters, pulmonary troubles, etc. The duration of the disease is not definitely known, but the mortality is more than 52 per cent., which is much higher than that known in cattle infected with other forms of trypanosomiasis. The number of trypanosomes in the blood of infected animals is very variable, being sometimes very numerous in those that still appear healthy, and sometimes very rare or absent during the course of the disease.

It is thought that this trypanosome is transmitted by some of the numerous Tabanids that attack infected herds, although the authors have searched in vain for flagellated forms in the intestines of some of these flies. The trypanosome concerned is described. A few experiments in inoculation were tried ; a guinea-pig and a dog were both inoculated from an infected monkey, but neither animal contracted the disease.

The question is discussed as to whether this trypanosome is identical with any of the flagellates naturally occurring in horses in South America, and a comparison is made with those previously recorded and with *T. evansi*, which has not yet been recorded from South America. The conclusion is reached that the trypanosome which infects cattle in the natural state, and cattle only, in French Guiana, is a new species, the name proposed for which is *T. guyanense*.

DE GOYON (J.). **Répartition du Paludisme dans les Territoires de Gora, Verca et d'Opara (Basse Albanie).** [Distribution of Malaria in the Territories of Gora, Verca and Opara (Lower Albania).]—*Bull. Soc. Path. Exot., Paris*, xii, no. 5, 14th May 1919, pp. 266–273.

The distribution of malaria in Lower Albania is described, being deduced from the splenic index of 36 villages in that region. The

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mosquitos taken in the territory include the Anophelines, *A. maculipennis*, *A. bifurcatus*, and *A.* (*Pyretophorus*) *palestinensis*, and the Culicines, *Culex hortensis*, *C. pipiens*, *Ochlerotatus* sp., and *Theobaldia longiareolata* (*spathipalpis*). Separate tables show the distribution of these species in the various villages examined. The territory is generally but not excessively malarial upon elevated ground, but is situated between two centres of infection, Lake Malik and the deep valley of Dévoli, the endemic index rising gradually with the approach to either of these districts. It is recommended that bivouacs and cantonments should be confined to a certain altitude and that troops should not be marched along ravines after sundown. Generally speaking the region is easily dealt with by regulating the course of the streams and draining the pools that are found about their beds. On account of the general occurrence of Anophelines, even at an altitude of nearly 4,000 feet, and of their probable abundance in the wet autumn season, quinine prophylaxis and the use of individual mosquito nets should be continued until the first frosts.

Paisseau (G.). **Une Entreprise d'Assainissement antipalustre au Maroc.** [Antimalarial Drainage Measures undertaken in Morocco.] —*Bull. Soc. Path. Exot., Paris,* xii, no. 5, 14th May 1919, pp. 274–287, 1 map.

The Valley of Sébou is one of the most unhealthy districts in Morocco owing to the great expanse of marshy land forming intensely malarial centres. Ever since the French occupation the luxuriant vegetation due to the abundance of water has caused many applications to be made for concessions of land to be drained for agricultural purposes. In view of these, the Government appointed a medical commission to determine the chief malarial centres and the advisability of draining them, and to suggest preventive measures to be observed by those employed in the work for the protection of the general public as well as themselves. Great importance is attached to this work, which necessitates the drainage of nearly 247,000 acres of land and the employment of about 20,000 workmen. The plans drawn up for the medical investigations were based on the methods previously employed in Algeria, and included careful search for mosquito larvae in all types of stagnant water; these seemed in abundance everywhere, especially in the clear pools on the borders of marshy depressions. After the month of April adult mosquitos were caught in all districts, the majority being *Anopheles maculipennis*. Clinical enquiries were made, but the mortality could not be definitely ascertained. The various centres of malarial infection are described, of which the marshes and lagoons are the most important.

The preventive measures for the protection of the workers necessitate strict supervision to prevent any contact with natives of the surrounding villages, and to enforce the use of mosquito nets. Preventive quininisation is a most important factor; although it will not completely protect those exposed to infection, it nevertheless greatly minimises the danger of the disease. All carriers must be removed from the working centres, for which purpose the erection of well-equipped hospitals and laboratories is essential.

Taylor (F. H.). **Contributions to a Knowledge of Australian Culicidae, no. 4.**—*Proc. Linn. Soc. New South Wales for the Year 1918, Sydney*, xliii, part 4, 27th November 1918, pp. 826–843, 4 plates. [Received 23rd June 1919.]

This is a continuation of a previous paper [see this *Review*, Ser. A, v, p. 67]. The following new species are among those described: *Pseudoskusea cairnsensis* from Queensland; *Mimeteomyia doddi* from Papua; *Culicada wilsoni* from Victoria; *Lophoceratomyia cairnsensis* from Queensland; *Uranotaenia tibialis* and *U. antennalis* from Queensland; and *U. hilli* from the Northern Territory.

A key is given to the Australian species of *Anopheles*, *Bironella gracilis*, Theo., being treated as a representative of a distinct genus.

Hornby (H. E.). **The Diagnosis of African Equine Trypanosomiasis.**—*Vet. Jl., London*, lxxv, no. 6, June 1919, pp. 218–225.

Trypanosoma brucei, *T. congolense* and *T. vivax* are the three species responsible for equine trypanosomiasis. The disease caused by *T. brucei* only differs in that it generally follows a rapid course, whereas that caused by *T. congolense* and *T. vivax* is more frequently chronic. All three are fatal.

The author's method of diagnosis is given, with tables showing the effects of infection by the different trypanosomes.

Battaglia (M. I.) & Barbará (B.). **Tifus exantemático. Contribución al Estudio de la Epidemiología argentina.**—*Anales Dept. Nac. Higiene, Buenos Aires*, xxv, no. 1, January–February 1919, pp. 3–46. [Received 23rd June 1919.]

The history of previous epidemics of exanthematic typhus in South America is reviewed. It is known that the disease is transmitted by lice and that it only occurs within certain degrees of temperature; in Europe cases are known during winter and spring; in Mexico the disease only occurs at certain elevations. The present paper reports upon an epidemic in Argentina which was investigated in July 1918, when it was found that spotted typhus had been endemic for years in the region inspected, which is situated on the river Luracatan, beneath the first ranges of the Andes. Pediculosis is general in this region, and typhus has occurred with more or less regularity in past years, most of the families there having lost some member from this disease. From the end of March to the middle of August 17 deaths occurred from the malady and 115 cases of illness, the inhabitants declaring that the mortality was no higher than usual, though the amount of sickness was exceptional. While it is remarkable that such a contagious infection should have persisted unnoticed and remained localised in the same region for a number of years, the explanation probably lies in the isolation of the towns concerned, which have very little communication with other parts, in the topography and climate, and in the absence of any medical authority or persons capable of diagnosing the disease. The present epidemic is considered to have been a recrudescence caused by an unusually cold season, resulting in greater crowding and contact among the very primitive population, lack of personal cleanliness, etc.

While recommending the usual measures for extermination of lice, which in that region are incredibly abundant, both *Pediculus capitis* and *P. humanus* (*vestimenti*) occurring, and for disinfection of clothing, buildings, etc., the authors are of opinion that a long period must elapse before the state of educational, intellectual and economic improvement will be such that general hygiene will constitute a successful resistance to the spread of the disease.

WOLLMAN (E.). **Elevage aseptique de Larves de la Mouche à Viande (*Calliphora vomitoria*) sur Milieu stérilisé à haute Température.**—*C. R. Soc. Biol., Paris*, lxxxii, no. 16, 31st May 1919, pp. 593–594.

The larvae of *Calliphora vomitoria* are easily reared on meat sterilised at a temperature of 115° C. (220° F.), but with a higher temperature the results are not so good ; this is probably due to the fact that the coagulation of the constituents owing to the increased temperature renders assimilation by the small larvae more difficult. To eliminate this factor brains were used in place of meat for further experiments.

When eggs of *C. vomitoria* sterilised with corrosive sublimate were placed in tubes containing brains sterilised at a temperature of 130° C. (226° F.) for 45 minutes, the emerging larvae thrived better than on the sterilised meat and were full-grown at the end of the 5th day.

The following hypotheses are tentatively suggested pending further investigations : (i) The vitamines of brain matter are not destroyed when heated to a temperature of 130° C. (266° F.) continued for 45 minutes. This seems scarcely probable since 120° C. (248° F.) has hitherto been considered sufficient to destroy them. (ii) The larvae of *C. vomitoria* do not need "certain accessory factors of growth." This is all the more remarkable in that the organism concerned is of very rapid growth, increasing by hundreds of times its own weight in a few days. (iii) The larvae themselves create vitamines from a food-substance that is devoid of them. Investigation is now in progress to elucidate these questions.

BROLEMANN (H. W.). **Sur quelques Culex des Pyréneés et Description d'une Espèce nouvelle.**—*Ann. Soc. Entom. France, Paris*, lxxxvii, nos. 3 and 4, 1918, pp. 425–440, 13 figs. [Received 25th June 1919.]

A new species of *Culex*, *C. pyrenaicus*, is described from a collection mosquitos from the Pyrenees.

NAGAYO (M.), MIYAGAWA (Y.), MITAMURA (T.) & INAMURA (A.). **Ueber das Prosopon und die Nymphe der "Tsutsugamushi."** [The Adult and Nymph of the Mite, *Leptotrombidium akamushi*, Brumpt.]—*Verhandl. Japan. Path. Gesellschaft, Tokyo*, vii, April 1917, pp. 133–135.

This is a detailed technical description of the adult and nymph of the mite carrying Tsusugamushi fever. The authors do not consider that Miyashima and Okumura are justified in adopting the name of *Leptus akamushi* [see this *Review*, Ser. B, vi, p. 187–8].

CARDAMATIS (J. P.). **Le Paludisme en Macédoine.**—*Grèce Médicale, Athens*, xx, no. 13–18, July-August–September 1918, pp. 21–30.

Owing to the wide tracts of marshy land and stagnant water, malaria is endemic in Macedonia perhaps to a greater degree than in the rest of Greece. The four species of Anophelines common to both regions are *Anopheles maculipennis*, *A. palestinensis* (*superpictus*), *A. bifurcatus* and *A. sinensis*, *A. maculipennis* being the commonest in Macedonia and *A. palestinensis* in Greece proper. The capacity of Anophelines for conveying infection is a factor to be added to those known to favour an epidemic, and in those years when malaria diminished *A. palestinensis* appeared to be smaller in size and of less vitality. The chief cause of this degeneration would appear to be severe cold in winter retarding its development.

KINGHORN (A.). **Plague in the Luangwa Valley, 1917-1918.**—*M.S. Report to the Administrator, Northern Rhodesia*, dated 9th May 1918. [Col. Off. 35246/18]

The outbreak of plague here recorded was chiefly confined to village rats (*Mus rattus*), although it is not suggested that *M. norvegicus* and field rats were not affected. Not uncommonly rats were infested with the larvae of a species of *Cordylobia*. No determinations were made of the species of fleas found on the rats.

GREGGIO (J.). **La Maladie du Sommeil dans l'Afrique équatoriale.**—*Etudes, Revue fondée en 1856 par des Pères de la Compagnie de Jésus*, clviii, nos. 1–2, 5th January 1919, pp. 41–64, 195–211. (Notice in *Trop. Dis. Bull., London*, xiii, no. 5, 15th May 1919, p. 271.)

An interesting popular account is given of sleeping sickness in equatorial Africa, dealing in turn with its history, aetiology, clinical manifestations, diagnosis, treatment and effect on the future of Africa.

CHAGAS (C.). [**Host of the** *Trypanosoma cruzi*.]—*Revista Medico-Cirurgica Brazil, Rio de Janeiro*, xxvi, no. 5, May 1918, p. 220. (Abstract in *Jl. Amer. Med. Assoc., Chicago, Ill.*, lxxi, no. 12, 21st September 1918, p. 1015.)

The author found that 45–50 per cent. of the armadillos caught in regions infested with Chagas' disease contained the causal trypanosome (*Trypanosoma cruzi*), which does not appear to affect them, though it is extremely virulent to man. The intermediate host, the bug, *Triatoma* (*Lamus*) *megista*, may possibly be a parasite of the armadillo.

DARLING (S. T.). **Sobre algumas Medidas anti-malaricas em Malaya.** [Some Anti-malarial Measures in Malaya.]—*Annaes Paulistas Medicina e Cirurgia, São Paulo*, ix, no. 12, December 1918, pp. 265–274, 3 plates.

This is a description of some of the measures, chiefly concerned with drainage, employed against malaria in Malaya.

KOBAYASHI (H.). **Chosen no Hai (Daiichi Hokoku).** [Flies in Korea. Report I.]—*Chosen Igakukwai Zasshi [Journal of the Korean Medical Society]*, *Seoul*, no. 24, 12th April 1919, 29 pp.

This report is the result of observations made on house-frequenting flies in Korea during 1916–1918. These flies (amounting to 400,000 individuals) were collected in the city of Seoul; the total numbers and percentages of all the species captured are shown in the form of tables for each year. Though according to the author's observations made in Tokyo in 1912–13 the maximum emergence of the house-fly [*Musca domestica*] was attained in July and August in Japan, in Korea this occurs in May, June and July and in August it diminishes, while in September it increases. In other words it appears that in Korea the prevalence of the house-fly does not coincide with the increase of temperature, a fact that is contrary to the results found by many investigators in other parts of the world. Other house-frequenting flies however appear abundantly in the months of July and August. In Seoul, the species that oviposit in the latrines are:—*Muscina stabulans*, Fall., *Fannia canicularis*, L., *Sarcophaga carnaria*, L., *Ophyra nigra*, Wied., *Musca autumnalis*, DeG. (*corvina*, L.), and occasionally *Musca domestica*, L., and *Lucilia caesar*, L. Latrines that are exposed to the sunshine produce more flies than those in the shade.

TRICO (P.). **El Baño de las Ovejas.** [Sheep Dips.]—*Gaceta Rural, Buenos Aires*, xii, no. 143, June 1919, pp. 735–745, 3 figs.

Detailed instructions are given, with a plan and sectional drawings, for the construction of a dipping apparatus for sheep.

DOTEN (S. B.). **Report of the Department of Entomology.**—*Ann. Rpt. Board of Control for the Fiscal Year ending 30th June 1918, Agric. Expt. Sta. Univ. Nevada, Reno*, 1919, pp. 16–18, 2 figs.

Owing to the abundance of biting flies injurious to cattle on the pastures of Nevada and California, investigations have been made, which have led to the conclusion that most of the annoyance is caused by a horse-fly, *Tabanus phaenops*. The females rest in dry grass during the late afternoon and early morning hours, obtaining their food during the hot part of the day partly from the blood of cattle and horses. The eggs are laid in short grass over swampy meadow lands; the emerging larvae drop to the ground and mature in the mud during the course of one or more years. As no possible method of control, either by the introduction of parasitic insects or by artificial means, has yet been discovered, a change from ranching to farming is apparently the only way to exterminate this pest.

MAJOCCHI (D.). **Il *Demodex folliculorum* sulla Pelle dei Leprosi.** [*D. folliculorum* on the Skin of Lepers.]—*Revd. R. Accad. Sci., Bologna*, New Series, xviii, 1913–1914, pp. 107–108. [Received 18th August 1919.]

Investigation as to the relation of *Demodex folliculorum* to *Bacillus leprae* has shown that this mite was present in only four out of the

seven cases of leprosy studied. The author believes that it is possible that *D. folliculorum* distributes the virus of leprosy on the patient himself and that it may perhaps also transmit the disease to healthy individuals.

Oesterlin (E.). **Erfahrungen über den mechanischen Schutz gegen Malaria.** [Practical Knowledge relating to Mechanical Protection against Malaria.]—*Arch. f. Schiffs- u. Trop.-Hyg., Leipzic*, xxiii, no. 3, February 1919, pp. 49–57.

On his appointment as Malaria Inspector at Durazzo early in 1917 the author was led to adopt mechanical measures of protection against mosquitos as the only workable method under the conditions then obtaining in Albania. Individual protection was found to be useless, as the men often lacked either the intelligence or the will, or both, to employ nets in a proper manner. Mass protection was successful, either in the form of an indoor cage enclosing a raised wooden platform accommodating a number of sleepers, or in that of a similar, but larger cage, erected out of doors under a weather-proof roof. In both cases the height was 2 metres, allowing free movement but making it difficult for mosquitos that entered to escape capture. Doors with a well-fitting frame were used, double doors being provided for the outdoor building. The latter could house 100 men and was divided lengthwise by a passage, and each half was again divided into 2 sections for 25 men each. This sub-division enabled any intruding mosquitos to be easily caught. Paper netting was the material used; this proved superior to the ordinary article in many ways and was remarkably resistant to rain.

Sikora (H.). **Zur Kleiderlaus-Kopflausfrage.** [The Body- and Head-Louse Question.]—*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzic*, xxiii, no. 4, February 1919, pp. 65–67.

In a previous paper it was stated that normal *Pediculus capitis* fed on the arm for several generations attained the average dimensions of *P. humanus* (*vestimenti*) [see this *Review*, Ser. B, vi, p. 191]. This has now been found to be incorrect.

If the length of the femur in the foreleg in the male and the number of rows of abdominal muscles (2 in *P. humanus* and in 1 *P. capitis*) in the female be accepted as reliable and constant characters, the indefiniteness of other characters and the variability in size is to be explained by the presence of the crosses between the two which make the morphological identification of a single individual quite impossible. An examination of the host and of the largest possible number of parasites is necessary to determine the species present.

Rickettsia pediculi, which sometimes occurs in *P. humanus*, was never found in *P. capitis*. In crosses positive findings of *Rickettsia* were noted on several occasions.

Traitement de la Gale des Pattes de Volailles. [Treatment of Mange in the Feet of Domestic Birds.]—*La Vie Agricole et Rur., Paris*, ix, no. 26, 28th June 1919, p. 472.

Parasitic mange of the feet attacks a number of birds, particularly poultry. The disease is very contagious, but is confined to birds, and as

its onset is very insidious and its development very slow, it may pass unnoticed until many birds have become infested. The Sarcoptid mite causing it is frequently conveyed to the head by scratching, and often causes the death of the bird. The mites can be destroyed by the parasiticides used against other Acarids of the same group, sulphur preparations being particularly efficacious. Fowl-houses, etc., should be thoroughly disinfected at the same time with hot water containing potassium sulphide.

Laurie (D. F.). **Factors Detrimental to the Poultry Industry.**—*Jl. Dept. Agric. S. Australia, Adelaide*, xxii, no. 9, April 1919, pp. 727–728. [Received 5th July 1919.]

In South Australia there is a remarkable absence of many of the fatal diseases of poultry common to other countries; the majority of cases of illness that occur are due to the poultry tick, *Argas persicus*. Owing to carelessness on the part of poultry keepers with regard to the presence of this tick, it is proposed to enforce the regulations concerning it that form part of the Stock Diseases Act of 1888. Under these regulations, anyone exhibiting for sale, or offering to sell any tick-infested poultry will be prosecuted. Inspectors have the power to seize and destroy all tick-infested birds. Infested buildings should be thoroughly treated with kerosene or Pintch gas residue; where this cannot be done, they should be burned.

Bouffard (G.). **Du Paludisme au Dahomey.**—*Bull. Soc. Path. Exot., Paris*, xii, no. 6, 11th June 1919, pp. 304–307.

For many years past, Dahomey has been regarded by the successive medical officers who have been on duty there as a centre in which endemic malaria rages at frequent intervals among both the military and civil population. While the situation has improved of recent years, the troops continue to suffer far more than the civil population, the latter being more permanently and more comfortably installed and having learnt the value of daily quininisation and the use of a mosquito net maintained in perfect condition. The taking of the endemic index among the 30,000 or more natives of Porto-Novo, the chief town of the Colony, situated on the edge of a lake, shows the percentage during 1916–1917 to be a low one, averaging about 9 per cent. for the year. The percentage is much higher in the rainy season, from May to November, and reaches its maximum in July, a month of comparative dryness, but not sufficiently so to affect the numerous breeding-places of Anopheline larvae created by the heavy rains of May and June. The low percentage of cases shows that Dahomey is one of the least malarial of this group of colonies, but it must be remembered that the figures quoted are only relative, and would not necessarily be true for any other year. Numerous cases have been noticed of primary infection with schizonts of tropical malaria among very young children and adults newly arrived in the colony, while it is to be expected that an exceptionally rainy winter would result in a largely increased number of *Anopheles* and a consequent rise in the malarial index. It would therefore be very unwise to relax any part of the anti-malarial prophylactic measures now carried out.

Laveran (A.) & Franchini (G.). **Au Sujet de l'*Herpetomonas ctenocephali* de la Puce du Chien et de sa Culture.**—*Bull. Soc. Path. Exot., Paris,* xii, no. 6, 11th June 1919, pp. 310–313, 2 figs.

The authors in an earlier note described *Herpetomonas ctenopsyllae*, obtained from *Ctenopsylla musculi* [see this *Review*, Ser. B, iii, p. 144]. They record in the present note the culture of a flagellate from *Ctenocephalus canis*, the dog-flea. The organisms, thus obtained, show a great resemblance to *H. ctenopsyllae*, but differ in having long flagella which are absent or very short in *H. ctenopsyllae*. It is hoped to make experiments to discover whether *H. ctenocephali* is inoculable to mammals.

Chatton (E.). **Sur la Culture pure d'un *Leptomonas* de la Puce du Chien et sur un Caractère de ses Formes culturales qui les distinguent de celles du Kala-Azar de Souches humaine et canine.** —*Bull. Soc. Path. Exot., Paris,* xii, no. 6, 11th June 1919, pp. 313–316.

During the course of experiments on kala-azar in October 1918, the author examined a dog of which the fleas (*Ctenocephalus canis*) were infected to the extent of 75 per cent. by a species of *Leptomonas*. No culture could be obtained either from the marrow of the leg-bones or from the blood. In view of the number of times that fleas have been considered to be connected with the transmission of Mediterranean kala-azar, investigations were made upon these flagellates to determine whether they were identical with those causing kala-azar, or definitely distinct from them. The inoculation of a culture from 30 fleas into two mice gave a negative result. A pure culture of the *Leptomonas* from these dog-fleas was obtained, and the flagellates are described. The author is convinced, in view of these investigations, that there is no relation between the *Leptomonas* isolated by him from the dog-flea and the *Leishmania* causing canine kala-azar in Tunis. Judging from its form, the species obtained seems to be distinct from the flagellates previously described by other investigators [see preceding paper].

In the course of the discussion following this paper, in reply to the question whether in the cultures of *Herpetomonas* obtained from these fleas there were any cysts identical with those obtained from the rectum or the excreta of these insects, it was stated that there were present in the cultures certain ovoid, non-flagellate forms that might be the equivalent of the cystic forms; these were however very rare in the fleas examined.

Chatton (E.) & Blanc (G.). **Inoculations positives de Cultures de *Leishmania tropica* aux Geckos.**—*Bull. Soc. Path. Exot., Paris,* xii, no. 6, pp. 316–322.

From experiments made to discover whether geckos act as reservoirs of the virus of Oriental sore, it has been found that *Tarentola mauritanica* is infected with *Leptomonas* in the south of Tunisia in the proportion of 37·5 per cent., but appears to be immune in the north. It would be interesting to discover the limits of distribution of this

flagellate. In the case of geckos inoculated with cultures of *Leishmania tropica*, the flagellates pass into the blood and can be recovered at least 13 days after inoculation. Neither *Leishmania* nor *Leptomonas* manifest their presence by any lesion of the blood or organs, nor can they be discovered by direct examination, but only in a culture medium. Oriental sore has never yet been produced either in men or monkeys by means of *Leishmania* passed through geckos, though whether the virulence is actually lost by this passage is not known.

Petit (G.) & Tournaire (P.). **Sur la Répartition des Gîtes d'Anophèles dans l'Arrondissement de Bergerac (Dordogne).**—*Bull. Soc. Path. Exot., Paris*, xii, no. 6, 11th June 1919, pp. 332–339.

The observations recorded in this paper on the occurrence of Anophelines in the environs of Bergerac were made in the course of compiling the Anopheline chart of France for the Malaria Commission. The districts examined are described in detail and their suitability as breeding places of mosquitos discussed. Bergerac, on the right bank of the Dordogne, is intersected with a network of canals, streams and ponds, providing both running and stagnant water which is nearly always polluted and forms excellent breeding-grounds for the development of mosquitos. The banks of the river are in many places overgrown with aquatic plants and these harbour an abundant fauna of *Anopheles*, *Culex* and other Diptera. In all the breeding-places in Bergerac only *Anopheles maculipennis* was found, but in one spot, in the shady park of a private residence, some larvae of *A. bifurcatus* were taken from the fresh water of a fountain. South of the Dordogne the outskirts of Bergerac extend into a plain, where a system of small streams, more or less permanent, and many small stretches of boggy ground harbour many larvae of *A. maculipennis* and *A. bifurcatus*, sometimes occurring together, but the former more abundantly than the latter. This plain and the valleys around generally show a greater abundance of Anophelines than the higher ground. Although *A. maculipennis*, the predominant species, prefers pure water, it is frequently found in soiled and polluted water in company with *Culex* spp. *A. bifurcatus* has only been found in clear, shaded, cold water, sometimes with *A. maculipennis*. In the region dealt with, malaria has been endemic for many years, and where mosquitos are abundant, it is considered only prudent to practice assiduously the various anti-mosquito measures.

Arkwright (J. A.), Bacot (A.) & Duncan (F. M.). **The minute Bodies (*Rickettsia*) found in Association with Trench Fever, Typhus Fever and Rocky Mountain Spotted Fever.**—*Trans. Soc. Trop. Med. Hyg., London*, xii, no. 4, 21st February 1919, pp. 61–73, 1 plate. [Received 8th July. 1919.]

It has not yet been decided whether *Rickettsia* are micro-organisms or not, the theory being either upheld or discounted according to the personal opinion of the observer. Experiments made, and here described, of the inoculation of healthy men and animals such as monkeys and guineapigs with trench fever and typhus fever and the subsequent feeding of lice on these patients, have led to the conclusions

that the organisms are constantly present in these lice and their excreta, of which a fraction of a milligramme is sufficient to infect man, and that *Rickettsia* of typhus does not appear in the excreta of lice with the same regularity as *Rickettsia* of trench fever. The association of *Rickettsia* with trench fever has previously been discussed [see this *Review*, Ser. B, vi, p. 237].

Monkey lice (*Pedicinus longiceps* ?) taken from a monkey infected with typhus on the 7th-8th day of the disease have been shown to contain *Rickettsia* and probably typhus virus. Lice from monkeys that have not been inoculated have never, so far, been found to contain *Rickettsia*.

STOCKMAN (Sir S.). **The Pathology and Epizootiology of Louping-ill (Disease of Sheep). With special Reference to Chromatin Bodies in the White Corpuscles.**—*Trans. Soc. Trop. Med. Hyg., London*, xii, no. 4, 21st February 1919, pp. 74–81. [Received 8th July 1919.]

Further investigations have been made with regard to the transmission of louping-ill by *Ixodes ricinus* [see this *Review*, Ser. B, vii, p. 17]. The experiments described were made by inoculating lambs and by feeding the ticks on the infected animals. The results of these investigations proved that the blood and juices of the oedematous glands from infected sheep cause identical symptoms and lesions when inoculated into healthy animals. The fluid when microscopically examined showed the presence of chromatin bodies which may prove to be parasitic in character, thus being the causal agent of louping-ill. Only fluid containing these bodies will produce the disease by inoculation. Further investigations are being made to confirm this theory. Sheep that have been inoculated show a high resistance to further inoculation and have survived a louping-ill season even though exposed on infected pastures.

MORRIS (L. M.). **Practical Anti-Malaria Work in the Aegean, 1917-1918.**—*Jl. R.N.M.S., London*, v, no. 3, July 1919, pp. 261–279, 6 figs.

Malaria conditions in the Aegean Islands, when R.N.A.S. aerodromes and airship stations were constructed there in 1916–1918, are described. Malaria in these islands occurs in localised endemic areas, caused by the winter flood water from the hills remaining in the low-lying marshes between the foot-hills and the sea. No drainage has ever been attempted, and the islands have remained for centuries in their primitive state, the Greek population continuing to live in the proximity of swamps and accepting the malarial conditions and the consequent lowering of their vitality with characteristic indifference and fatalism. Aerodromes had to be constructed of necessity in low-lying, flat country and therefore inevitably adjacent to swamps and marsh land. The native population was already highly malarial, mosquitos were numerous, supplies for anti-malarial measures were not at once forthcoming and preventive work had not been commenced. The result was a very high sick rate from malaria in the islands of Thasos and Kassandra from June to October in 1916. A military guard of 84 men was reduced to 14 effectives after a few weeks, the

malaria proving of a particularly malignant type. It was decided to undertake drainage of the marshes before the summer of 1917. Supplies of quinine, netting, oil, paraffin and implements were obtained, but it was soon evident that personal prophylaxis, such as the use of nets, was impossible at times, such as during night operations or enemy bombing raids.

At Thasos, the aerodrome was built between a thickly overgrown marsh, that formed an ideal breeding-place for Anophelines, and a belt of olive trees, among which the tents were pitched. The drainage of this marsh presented considerable difficulty and a permanent channel to the sea was constructed of baulks of timber supported by stones and fitted with a sluice gate. This caused a considerable fall in the marsh water-level and was reinforced when necessary. Olive trees, if near a marsh, have a definite influence on malaria, the flowers attracting mosquitos and affording suitable food for them. The marsh was drained near the aerodrome and the area near the camp cleared by burning and cutting away bushes. The channels were sprayed once a week, after clearing the surface of weeds, with heavy Burma oil mixed in equal parts with low-grade paraffin, half a pint of the mixture being used per hundred square feet of surface. Subsoil drainage proved to be the most important of all anti-malarial work and rapidly reclaimed large areas of marsh. The lagoons near the beach were kept open to the sea and made tidal. They soon became stocked with small fish and remained free from larvae. Old, disused wells were located and filled in. Garden ditches were cleaned out and linked up to the main system.

The species found in Thasos were *Anopheles maculipennis*, which, however, lacked the distinctive spotted markings on the wings. *A. bifurcatus* was present, but in smaller numbers. A large plan of the extensive drainage scheme was made to facilitate routine inspection, and the system was constantly repaired and cleaned. Lectures on personal prophylaxis were given to the men, who were well supplied with nets, cap veils, gloves, etc. Quinine was administered daily in alternate doses of 5 gr. and 10 gr. Mosquito-proof huts were used after sunset.

The first mosquitos in 1917 appeared in June and no cases of malaria occurred until 17th July ; after this date the aerodrome was heavily bombed and the men were obliged to spend three nights in mosquito-infested dug-outs or among the trees, with the result that there was a sharp outbreak of malaria. The incubation period had been considerably delayed by quinine and all cases were of a modified type, mostly tertian. The patients rapidly recovered and no more cases occurred until after the middle of October.

By April 1918, the marsh was completely dry and could be cleared by burning, and large areas of old swamp land were reclaimed for maize crops by the natives. The results were most gratifying. No malaria occurred among the men left as a maintenance party, the main body of men having been evacuated.

It was observed at Thasos that, given a belt of olive trees and a steady prevailing night wind, the Anophelines may travel for $1\frac{1}{2}$ miles. The author considers that malaria could be eradicated in Thasos in two years of active Government control, unhampered by questions of economy, and such measures would greatly increase the value of the island.

Similar work is described in Kassandra, Stauros, Mitylene, Imbros, and Syria, in all of which conditions were greatly improved. The author has reached the conclusion that quinine should be administered in solution, in intermittent lethal doses, in malarial localities where infection is expected and especially under active service conditions. If, however, nets can be used every night and there exists an efficient anti-malarial prophylaxis, quinine may be reserved until its use is indicated. The treatment of the disease is discussed, the author considering that the best treatment of malaria, after the pyrexial stage and in the subsequent course for the prevention of relapses, consists of an early and effective combination of arsenic with quinine.

The Aegean Islands are as yet largely undeveloped, and money is required to undertake scientific drainage before they can be made as healthy and prosperous as they might well become.

VAN SACEGHEM (R.). **Observations sur les Trypanosomes des Animaux sauvages.** —*Rev. Zoologique Africaine, Brussels*, vii, no. 1, 25th May 1919, pp. 55–56. [Received 16th July 1919.]

Wild animals have been proved to be the reservoir of infection of trypanosomiasis, and from them the disease is transmitted by *Glossina* to domestic animals.

Experiments further prove that the strain in the blood of these animals is much more virulent when injected directly into domestic animals than when transmitted by *Glossina*, although the relative number of trypanosomes contained in it is very small as shown by laboratory examinations. The decrease in virulence of trypanosomes, when transmitted by *Glossina*, is probably due to the change they undergo in the alimentary canal of the fly.

RODHAIN (J.). **La Limite septentrionale de l'Aire d'Extension de la *Glossina morsitans* entre le Lualaba et le Lac Tanganyika.**—*Rev. Zoologique Africaine, Brussels*, vii, no. 1, 25th May 1919, pp. 57–64, 1 map. [Received 16th July 1919.]

Observations have been made to determine the northern limit of *Glossina morsitans* between the Lualaba River and Lake Tanganyika. The country from Kasongo to Kabambare, which varies greatly both as to elevation and vegetation, is described. Along this route four species of *Glossina* have been found, namely, *G. palpalis*, *G. pallidipes*, *G. morsitans* and *G. brevipalpis*.

G. palpalis, R. D., was met with along rivers wherever there were sufficient trees to furnish the required shade and humidity, as well as in abundance on the shores of Lake Tanganyika. In some places, although the conditions seemed favourable, the flies were not found in great numbers owing to the altitude.

Glossina pallidipes, Aust., was found together with *G. morsitans* to the east of Kabambare in plains of sparse vegetation, but disappeared towards Niembo. It was also met to the north of Kongolo, where *G. morsitans* is not present.

With the exception of two isolated individuals caught in the plain, *G. brevipalpis*, Newst., was only found in the forest bordering the rivers and streams.

G. morsitans, Westw., is met with all the way from about 7 miles beyond Kabambare on the road to Tanganyika up to the Kalembe mountains, increasing in numbers where vegetation becomes denser. Thus the area covered by *G. morsitans* borders closely on the south-eastern limit of the great equatorial forest and reaches far beyond 5° S., apparently extending between the 28th and 29th parallels, to the east at least, nearly as far as 4° S.

The absence of *G. morsitans* east of Kalembe as far as Baraka is surprising in view of the favourable conditions, but is possibly due to the barriers caused by the mountain chain covered with scanty trees stretching parallel with Lake Tanganyika as far as Lake Edward.

Mercier (L.) & Lebailly (C.). **Myxosarcome et Acariens chez une Poule.**—*C.R. Soc. Biol., Paris*, lxxxii, no. 21, 5th July 1919, pp. 802–803.

A case of cancer in a hen is described, the tumour being a myxosarcoma. The bird was infested by numbers of Sarcoptid mites, belonging to two species, *Laminosioptes cysticola* and *Cytoleichus nudus*, the former being present in the conjunctive tissue of the thoracic muscles and thighs and the latter in the respiratory system. The hypothesis has already been suggested by Borrel that Acarids may play the rôle of carriers of cancerous tumours to man and other mammals, by inoculating the cancer virus, if such there be, into receptive cells. Although this hypothesis has been disputed by certain authors, it is suggested that it might be well to investigate the possibility of a connection between this infestation by *C. nudus* and the existence of the myxosarcoma. In view of the fact that tumours have been produced in hens by inoculating them, not with intact cancerous cells but with an extract from tumours, it is suggested that *C. nudus* may act in the same rôle as the needle of a syringe.

Torrance (F.). **Cattle Mange in the West.**—*Agric. Gaz. Canada, Ottawa*, vi, no. 6, June 1919, p. 531.

In consequence of the prevalence of cattle mange in southern Alberta and south-western Saskatchewan, restrictions have existed for many years over these regions, prohibiting the movement of cattle out of that area. The difficulties of collecting cattle for dipping owing to the nature of the country are described; in spite of these, regular dipping has so greatly improved the conditions that a large territory is practically free from infestation, and very shortly some 8,000 square miles will be freed from the regulations. The ranch lands are gradually being divided up into small holdings and fenced in, and under these conditions the eradication of mange will become easier, and it is hoped that the boundaries of the mange area may gradually be contracted until the infestation is finally eradicated [see also this *Review* Ser. B, vi, pp. 14, 15].

Weiss (A.). **Sur un Nouveau Pulicide,** *Ceratophyllus haesidatoris desideratus* ♂, **nouvelle Sous-espéce.**—*Arch. Inst. Pasteur, Tunis*, xi, no. 1, June 1919, pp. 24–27, 2 figs.

Among material collected in southern Tunisia in April 1914 is a new flea, described under the above name, having all the appearance of a hybrid between *C. maurus*, Roths., with some allied species such as *C. barbarus*, Roths. *C. maurus* has been taken in spring in the department of Algiers on *Jaculus orientalis* and also in the Algerian mountain chain in the department of Constantine on *Meriones shawi*. This Tunisian form was taken in the extreme south of Tunisia on *Psamomys algirus* and *Mus alexandrinus*. The male only is described, the female being unknown.

Rodhain (J.). **Remarques au Sujet de la Biologie de l'***Ornithodorus moubata*.—*C.R. Soc. Biol., Paris*, lxxxii, no. 23, 19th July 1919, pp. 934–940.

As man is the preferred host of *Ornithodorus moubata*, this tick is normally found only in places frequented by human beings. It feeds slowly and prefers to do so by dusk or at night and is therefore found chiefly in places where human beings go to rest or sleep, particularly the interior of dwelling-houses. It avoids damp, and after feeding, chooses a dry hiding-place in some crack in the wall, or, if the huts are of thatch, hides in the straw of the walls or roof until night, when it drops upon the bed of the inhabitant.

Various observations of previous years have shown that the parasitism of *O. moubata* is not always as exclusive to man as was at first thought. The tick has been discovered in the burrow of a warthog in Rhodesia [see this *Review*, Ser. B, iv, p. 44], on domestic pigs [*loc. cit.*, v, p. 35], and the biological significance of this aberrant parasitism has been discussed [*loc. cit.*, v, p. 36].

The author records two further instances that have come to his notice. During military operations in 1916 in Urundi, ex-German East Africa, many spirillary infections were reported among the troops temporarily encamped at Usumbura. A few of the soldiers infected had lodged in houses infested with *O. moubata*, but the majority were in tents situated in avenues of old mango-trees. Ticks were searched for in one of these avenues, where old huts that had swarmed with *O. moubata* had been a few years previously, and even in the soil about the sites of the old houses, but without success. Finally however, ticks were found under pieces of dried bark on the trunk of an old mango-tree, about four inches above the roots, where they had probably taken refuge after the destruction of the houses, awaiting a suitable host. These conditions of life resemble those of *O. savignyi*, which, in British Somaliland, lives in the dust around wells and pools, pending the arrival of a suitable host and attacking indiscriminately men, camels, or any domestic cattle [see this *Review*, Ser. B, iii, p. 229].

While examining examples of *O. moubata* at Ujiji in 1918, for the existence of spirochaetes, the author was surprised to find some of the ticks engorged with the blood of birds. Upon investigation it was discovered that these individuals had been taken from a temporarily unoccupied room in a native house, where two hens had been coming regularly at night to sleep under a disused bed, and the hungry ticks had without doubt fed upon them.

A recent note on the occurrence of *O. moubata* in the Middle Congo [see this *Review*, Ser. B, vii, p. 51] draws from the author some observations regarding the distribution of this tick in tropical Africa. This was first established by a map drawn up by Dutton and Todd in 1905, when the presence of *O. moubata* in the middle Belgian Congo and the region of the Cataracts was recorded. In most of the settlements made by the Arab slave-traders, *O. moubata* soon appeared. When, in 1890, the Arabs from the east were definitely stopped in their march westwards, they had reached the post of Basoko on the Congo, and had established many settlements around Stanleyville, but although these settlements still exist and maintain trade relations with many Arab centres of the south that are heavily infested with ticks, Stanleyville has as yet escaped infestation. Previous writers have recorded that ticks are more frequently found in Arab houses than in native huts. This has been explained by the fact that the former are drier, in better condition, and occupied for longer periods than the latter; for it is well-known with what frequency and facility the natives break up and remove their settlements. The author considers that another important factor opposes the rapid propagation of this tick in the lower equatorial regions, namely, the great atmospheric humidity that exists there at all seasons; such humidity, if it is not a direct obstacle to the multiplication of this parasite, at least prevents it from surviving when deprived of man, its normal host. When travelling in the south of Katanga, the author observed that below 9° S., *O. moubata* seems to occur in every native dwelling, however rudimentary. The country slopes gradually lower towards the north-west and becomes decidedly more humid, as is shown by the existence there of the great equatorial forest. *O. moubata* does not occur there. On the other hand, the tick is uniformly present in the region of the Cataracts, in Portuguese Angola, the Belgian Kwango and certain parts of the French Congo. All these regions where the tick is disseminated among the native population consist of wooded or park land, where the dry seasons are sharply defined, and although the inhabitants are constantly shifting and changing their dwellings, *O. moubata* flourishes there. It seems logical to conclude that in very humid regions, particularly those covered by the dense equatorial forest, these ticks, temporarily deprived of their normal host, rapidly succumb. It is obviously not because they lack animals that would serve as occasional hosts; elephants, warthogs, and many almost hairless mammals exist in the forest, and antelopes are frequently abundant.

There is, in the north-east of the Belgian Congo, a stretch of country that is threatened with the invasion of *O. moubata*; this comprises the mining regions of Upper Ituri and Upper Welle. Communications have been maintained for several years between these regions and Uganda along a caravan route. This route for a long distance runs through open or slightly wooded country, and then for several days' march crosses a vast expanse of equatorial forest. It will be interesting to observe whether the forest belt will arrest its progress, or whether it will spread over the northern plains without becoming established within the forest itself. The author is convinced that the latter eventuality will occur.

Lebailly (C.) & Caillon (L.). **Le Trypanosome de *Bufo mauritanicus*.**—*Arch. Inst. Pasteur, Tunis*, xi, no. 1, June 1919, pp. 28–30, 1 plate.

The authors have studied in Tunis the trypanosome found in the blood of *Bufo mauritanicus*, which they describe; they have arrived at the conclusion that it is identical with *Trypanosoma bocagei*, França, found in the blood of *Bufo regularis* in Portuguese Guinea.

Nicolle (C.) & Lebailly (C.). **Recherches sur les Maladies à Spirochètes du Rat transmissibles au Cobaye.**—*Arch. Inst. Pasteur, Tunis*, xi, no. 1, June 1919, pp. 6–13.

Experiments described in this paper show that the virus of infective jaundice, while apparently inactive upon the rats, mice and guinea-pigs tested, is retained by them for a long time, perhaps indefinitely. Certain guinea-pigs die after inoculation without showing the characteristic lesions of infective jaundice; in such cases it is necessary to pass the virus on from them by inoculation into a second guinea-pig. In the case of a mouse carrying spirochaetes, the virus did not pass from the female to the offspring, and inoculation from the organs of a foetus from a female infected with spirochaetes did not infect a healthy guinea-pig, but rendered it immune to test inoculations. The virus is apparently no better preserved in leeches than in a refrigerator.

Metz (C. W.). ***Anopheles crucians*, Wied., as an Agent in Malaria Transmission.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 25, 20th June 1919, pp. 1357–1360.

Investigations with regard to the importance of *Anopheles crucians*, Wied. [see this *Review*, Ser. B, vii, p. 47] have been continued. Although the habits of this mosquito are probably less conducive to natural infection than those of *A. quadrimaculatus*, it is evident that a certain amount of infection occurs owing to the susceptibility of *A. crucians* to infection under natural conditions, and it is a suitable host for both aestivo-autumnal and tertian malaria. An attempt was made to secure the relative number of infected individuals of *A. crucians* and *A. quadrimaculatus*, and the percentage of infected individuals was found to be approximately the same in both species, though the amount of individual infection is greater in *A. quadrimaculatus*. Although when compared with the latter, *A. crucians* would seem unimportant as a malaria transmitter, reports have been received from various districts showing a prevalence of malaria where *A. crucians* was found to be the predominant, if not the sole Anopheline. To judge by the habits of *A. crucians* it most probably bites only out of doors, its occurrence in dwellings being very rare; this fact must be taken into consideration as regards preventive measures.

Abbott (W. S.). **A Study of the Effect of Storage, Heat, and Moisture on Pyrethrum.**—*U.S. Dept. Agric. Washington, D.C.*, Bull. no. 771, 21st February 1919, 7 pp.

An abstract of this paper will be found in this *Review*, Ser. A, vii, p. 362.

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KIEFFER (J. J.). **Chiromides d'Australie conservés au Musée National Hongrois de Budapest.**—*Annales Musei Nationalis Hungarici*, XV, 1917, pp. 175–228, 18 figs.

This paper includes keys to the Australian species contained in the genera belonging to the sub-families CERATOPOGONINAE, TANYPODINAE and CHIRONOMINAE.

The species of *Culicoides*, Latr., dealt with, are *C. decempunctatus*, Skuse; *C. lineatus*, sp. n., from New Guinea; *C. guttipennis*, Meij.; *C. xanthoceras*, sp. n., from New Guinea; *C. marmoratus*, Skuse, *C. molestus*, Skuse, *C. sydneyensis*, Skuse, *C. subnitidus*, Skuse, *C. nigellus*, Skuse, *C. aeratipennis*, Skuse, *C. minusculus*, Skuse, *C. brevitarsis*, sp. n., from Australia; and *C. australiensis*, sp. n., from New Guinea.

Other new species described include *Ceratopogon punctum-album*, *C. australiensis*, *C. flaviventris*, *C. lepidopus*, *Atrichopogon bifasciatus*, *A. immaculatus*, *A. birói*, *A. sessilis* and *A. vestitipennis*, all from New Guinea; *A. coracinus*, *A. atratus* and *A. atratus* var. *rufiventris* from New South Wales; *Leptoconops spinosipes* from New Guinea; *Palpomyia bifasciata* from Queensland; and *P. imparunguis* from New Guinea.

KIEFFER (J. J.). **Chironomides d'Amérique conservés au Musée National Hongrois de Budapest.**—*Annales Musei Nationalis Hungarici*, XV, 1917, pp. 292–364, 43 figs.

Keys are given to the genera of CERATOPOGONINAE and to the American species, with descriptions of the following new ones: *Ceratopogon coquilletti* from U.S.A.; *C. tropicus* from Costa Rica; *Atrichopogon microtomus*, *A. pallidipes*, *A. piceiventris*, *A. fiebrigi* and *A. sancti-laurentii* from Paraguay; *A. auricoma* and *A. columbianus* from Colombia; *A. peruvianus* from Peru; *Culicoides columbianus* and *C. sanctaemarthae* from Colombia; *C. hirtipes* from Peru; *C. villosipes* from Paraguay; *C. undecimpunctatus* from Argentina; *Palpomyia tenuicrus*, *P. crassicrus* and *P. inermicollis* from Paraguay; *P. microchela* and *P. columbiana* from Colombia; *P. callangana* from Peru; *P. boliviensis* from Bolivia.

BAYLIS (H. A.). **A new Species of the Nematode Genus *Crossocephalus* from the Rhinoceros.**—*Annals & Mag. Nat. Hist., London*, iv, no. 20, August 1919, pp. 94–98, 2 figs.

The Nematode, *Crossocephalus longicaudatus*, sp. n., found parasitic in a rhinoceros (*R. sumatrensis*) from the Malay Peninsula is described and compared with *C. viviparus* which occurs in the zebra.

LITTLE (A.). **Contagious and Infectious Diseases of Poultry.**—*Rhodesia Agric. Jl., Salisbury*, xvi, no. 3, June 1919, pp. 231–235.

The diseases recorded as occurring in Rhodesia among fowls include spirochaetosis transmitted by the poultry tick, *Argas persicus* [see this *Review*, Ser. B, vii, p. 95].

Southon (C. E.). **Some Points of General Interest on the Subject of Plague.**—*Jl. E. Africa & Uganda Nat. Hist. Soc., Nairobi*, no. 14, July 1919, pp. 361–381, 4 figs.

This paper deals with the history and bacteriology of plague, including the mode of transmission, in which fleas are by far the most important factor. The general life-history and mode of dispersal of these insects is discussed and the technique employed in collecting and examining them is described.

The following species are compared and described:—*Pulex irritans* (human flea); *Xenopsylla* (*P.*) *cheopis* (rat flea); *Ceratophyllus fasciatus* (European rat flea); *Ctenocephalus felis* (cat flea); *Ctenopsylla musculi*, found on mice and rats; and *Echidnophaga* (*Sarcopsylla*) *gallinacea* (fowl flea).

Montgomery (R. E.). **Insects and their Relation to some Diseases of Stock.**—*Jl. E. Africa & Uganda Nat. Hist. Soc., Nairobi*, no. 14, July 1919, pp. 381–400.

This report of a lecture deals with the general mode of transmission of various diseases of stock by means of insects, with special reference to Diptera and Acarina.

McDonald (A. H. E.). **The Prevention of Blow-fly Attacks on Sheep by Spraying.**—*Agric. Gaz. N.S.W., Sydney*, xxx, no. 6, June 1919, pp. 403–405, 3 figs.

Experiments made to ascertain the value of spraying sheep as a protection from blow-fly attacks show that, although this treatment does not afford complete protection, it nevertheless greatly reduces the numbers of affected sheep, the average being 33 per cent. in the treated flocks as against 54 per cent. in the untreated ones.

The materials used for these tests included an arsenical sheep dip powder, a carbolic liquid dip and a mixture of which the active agent was arsenite of soda. They were all applied by means of a very heavy jet about $\frac{1}{8}$ of an inch in diametre with a pressure of about 60 lb. During the period of treatment crutching was omitted and the application was repeated after six weeks. Apparently the attacks are localised by this treatment, but further investigations are being made to confirm this.

Hirschfelder (A. D.) & Moore (W.). **Clinical Studies on the Effects of Louse Bites: *Pediculus corporis*.**—*Arch. Internal Med., Chicago, Ill.*, xxiii, no. 4, 15th April 1919, pp. 419–430.

The appearance of an eruption on the skin of persons in normal health bitten by *Pediculus humanus* (*corporis*) has previously been noted by Moore. The observations here recorded were undertaken to determine if the above phenomenon is general or simply due to a personal idiosyncracy. The conclusions reached are that the louse secretes a substance sufficiently toxic to produce a generalised cutaneous eruption and a mild fever. This may or may not be a protein. The absence of any regularly occurring weal or other lesion at the site of feeding demonstrates that it probably is not a local irritant such as those introduced by the sting of a bee or the bite of a mosquito, and it is probably not one of the lower organic acids.

Curasson (M. G.). **Sur le Traitement des Trypanosomiases animales au Soudan.**—*Bull. Soc. Cent. Méd. Vét.*, no. 9, 1918. (Abstract in *Trop. Vet. Bull., London*, vii, no. 1, 30th March 1919, pp. 8–10.)

In this discussion on the treatment of the various animal trypanosomiases in the French Sudan it is stated that "baleri," due to *Trypanosoma pecaudi*, occurs more frequently in the ox and zebu and crosses between them than has hitherto been recorded. The author encountered the condition only among these animals in the north-western regions of the French Sudan, but it exists in an enzootic form in other districts. Tsetse-flies (*Glossina*), which are generally considered to be the transmitting agents, do not occur in this region. On the other hand *Stomoxys* is common in the swampy areas. "M'bori," which is clinically identical with surra due to *T. evansi*, is a very common disease in camels in the northern part of the French Sudan, especially around swampy districts where *Stomoxys* are the only biting flies seen.

Grassi (B.). **L'Expérience de Prophylaxie antimalarique à Fiumicino.** —*Bull. Mens. Office Internat. d'Hygiène Publique, Paris*, xi, no. 6, June 1919, pp. 592–608.

The antimalarial measures here described aimed at destroying the breeding-places of mosquitos. On the whole, success was not attained as regards immediate results, but the work should be persevered in and extended over a larger area. Contrary to a widespread opinion the operations must not cease in winter. At Fiumicino larvae of *Anopheles maculipennis* (*claviger*) were found in collections of water swollen by the November rains, and at the end of December those of *A. bifurcatus* also occurred. It is pointed out that when the measures were begun early in April 1918 the descendants of mosquitos that had hibernated were met with.

Valle (V.). **Sui Metodi di Lotta contro le Malattie infettive messi in Pratica al Campo inglese di Cimino.** [The Measures against Infectious Diseases taken at the English Camp at Cimino.]—*Ann. Med. Navale e Colon., Rome*, Year xxv, Vol. i, no. 3–4, March–April 1919, pp. 286–293.

This is the fifth of a series of six reports on the sanitation of coastal zones in 1918; the first four deal with anti-malarial work in Italy and the sixth relates to the same subject at Vallona.

The anti-malarial work at Cimino was done on the recognised lines of drainage, screening and quinine prophylaxis. In the entomological laboratory research of a purely scientific nature was also carried out with a view to solving such questions as whether eggs laid by mosquitos harbouring haematozoa also contain malaria organisms. It has been experimentally found that a 1 : 10,000 solution of copper sulphate indirectly checks the development of mosquito larvae by killing the minute algae that they feed on. The mosquitos hitherto found are *Anopheles maculipennis, A. bifurcatus, Culex pipiens, C. hortensis, Culex* sp., *Theobaldia annulata, T. longiareolata* (*spathipalpis*), *Theobaldia* sp. and *Ochlerotatus dorsalis*. The methods adopted against flies and lice are also briefly outlined.

LORENZ (Fr. H.). **Beobachtungen bei der Fleckfieberbekämpfung in Rumänien.** [Observations during Anti-Typhus Work in Rumania.] —*Arch. f. Schiffs- u. Tropen-Hygiene, Leipzic*, xxiii, no. 9, May 1919, pp. 157–170.

One of the conclusions reached is that typhus cases may prove infective to lice as much as 3 weeks after the end of the fever. After a period of 6 weeks this does not seem to be the case. The incubation period for typhus was found to be 14 days.

CURASSON (M. G.). **Au Sujet du Traitement de la Gale du Dromadaire.** —*Recueil Méd. Vétérinaire d'Alfort, Paris*, xciv, no. 22, 30th November 1918, pp. 481–482.

Sarcoptic mange is particularly serious in the case of camels and dromedaries, and in some caravans all the animals may be affected and reduced to a serious condition of wasting. The Moors resort to applications of tar after pulling out the hairs; fermented camel urine, which is strong in ammonia, is also used for softening the crusts. The lack of prophylaxis accounts for the rapid spread of the disease. Good results were obtained with a grease ointment containing sulphur and cresyl, but the grease impedes clipping and turns rancid owing to the heat and may cause vesication. A soap ointment has given very excellent results. This may be prepared by soaking white soap shavings 1½ lb. in tepid water 1 qt. After 24 hours flowers of sulphur ¾ lb. and then cresyl ½ lb. and petroleum 6 oz. are added. After clipping, the paste is applied with a brush or by hand and well worked in with the finger tips. On the following day some of the paste will be found on the hair and should be rubbed back on to the skin. After an interval of 4 days the parts are cleansed with a brush and tepid water. In conjunction with segregation this treatment has given excellent results. Of 100 camels so treated there were only about 10 cases of re-infestation.

TULLGREN (A.). **Våra Insekter såsom Sjukdomsspridare.** [Our Insects as Carriers of Diseases.]—Stockholm, 1918, 30 pp., 24 text-figs.

This popular treatise on the part played by insects as carriers of diseases is published by the direction of the Swedish Board of Health. It deals with the following species: *Musca domestica*, L., *Stomoxys calcitrans*, L., *Muscina stabulans*, Fall., *Fannia canicularis*, L., *Sarcophaga carnaria*, L., *Calliphora vomitoria*, L., *Culex pipiens*, L., *Anopheles maculipennis*, Mg. (*claviger*, F.), *Melusina reptans*, L., *Culicoides pulicarius*, L., *Pediculus*, *Cimex lectularius*, L., *Pulex irritans*, L., and *Sarcoptes scabei*, DeG.

VAN SACEGHEM (R.). **Cause étiologique et Traitement de la Dermite granuleuse.**—*Ann. Méd. Vét., Brussels*, lxiv, no. 5–6, May–June 1919, pp. 151–154.

Further experiments confirm the author's previous remarks on *Habronema muscae*, the causal agent of granular dermatitis in horses [see this *Review*, Ser. B, vi, p. 13]. It has also been proved that

although house-flies (*Musca domestica*) are responsible for transmission they can only be infected during the larval period. Attempts to cause the disease by placing larvae of *H. muscae* removed from horse manure on the skin of horses failed, as they are unable to pierce the skin and quickly die when exposed to a dry atmosphere, though in a moist medium they may remain alive for over 12 hours.

The prophylactic measures advocated are the destruction of the adult, *H. muscae*, by internal applications of 1 to 2 gr. of arsenic given to the horse daily and the immediate removal of manure to heaps where the fermentation and heat produced will kill all larvae including those of flies. All wounds should be protected from flies, for which the following formula is recommended, as it also contains curative properties: plaster of Paris 100 parts, alum 20, naphthaline 10, and quinine or any other bitter powder 10. This should be repeatedly applied until there is not the slightest sign of exudation from the wound.

Cantacuzène (J.). **Rôle du Pou dans le Typhus exanthématique et Temps d'Incubation de la Maladie.**—*Bull. Soc. Path. Exot., Paris*, xii, no. 7, 9th July 1919, pp. 364–367.

Details of fifteen cases are recorded showing the importance of lice as typhus transmitters. Attention is drawn to the fact that upon removal of one of the cases to hospital the patient's bed, which was infested with lice that had fed freely on him after infection, was immediately occupied by a laboratory attendant who, though exposed to the bites of the same insects, did not contract the disease. The incubation period, as ascertained by these observations, varied from 7 to 23 days.

Laveran (A.) & Franchini (G.). **Infection des Souris blanches à l'Aide des Cultures des** *Herpetomonas ctenocephali*.—*Bull. Soc. Path. Exot., Paris*, xii, no. 7, 9th July 1919, pp. 379–383, 3 figs.

Experiments have been made to estimate the result of inoculating mice with pure cultures of *Herpetomonas ctenocephali* obtained from the dog-flea [*Ctenocephalus canis*]. The technique employed and the results of the various blood tests made are described. From blood taken from the heart of a mouse pure cultures were obtained of flagellates that were identical with those from the digestive tract of the parasitised dog-flea.

Croveri (—.) & Salvestroni (—.). **Rogna demodettica nel Cavallo.** [Demodectic Mange in the Horse.]—*Bull. Soc. Path. Exot., Paris*, xii, no. 7, 9th July 1919, pp. 388–390, 1 fig.

Cases of demodectic mange in the horse are rare and apparently none have been recorded from Africa. In this instance a mare in Italian Somaliland was found to be infested with *Demodex folliculorum* var. *equi somaliensis*, var. n. This variety differs in size from that of man and dog, and from that of the pig in the form of the proboscis.

Phipps (F. E.). **Les Trypanosomiases dans la Région de Carnot (Haute-Sangha).**—*Bull. Soc. Path. Exot., Paris,* xii, no. 7, 9th July 1919, pp. 416–434, 1 map.

Extensive investigations have been made in the Upper Sangha district of the French Congo to ascertain the distribution of sleeping-sickness. The country in the districts examined is described and the results are given for each. The distribution of the disease and of *Glossina palpalis* is shown on a map. Although the incidence of the disease has become decidedly less during both the French and German occupations, all precautions should still be strictly adhered to. A serious hindrance to the eradication of the disease is the continuance of recruiting among distant tribes for workmen who pass through infested areas and thus become a new source of danger. In 1917–18 these amounted to 2,103 individuals.

The animals used for transport are chiefly humped cattle, and although they survive the dry season, they frequently become infected during the rainy season. Examination has shown the infection to be due to *Trypanosoma cazalboui*, but how the animals become infected has not been ascertained, since careful search failed to reveal the slightest presence of *Glossina* in this infested area. Infection may be contracted on the road or transmitted by *Stomoxys*, which is abundant, provided there is a reservoir of infection in the immediate neighbourhood, though this has hitherto escaped detection.

Robles (R.). **Onchocercose humaine au Guatémala produisant la Cécité et "l'Erysipèle du Littoral" (Erisipela de la Costa).**—*Bull. Soc. Path. Exot., Paris,* xii, no. 7, 9th July 1919, pp. 442–460, 6 figs.

Investigations were made to ascertain the cause of the disease known in Guatemala as coast erysipelas. The causative agent is apparently an unidentified parasite greatly resembling *Onchocerca volvulus* and it is probably transmitted by the flies, *Simulium samboni* and *S. dinelli*, though this requires further proof.

The infection seems limited to certain districts, the affected zone being very clearly defined ; it is apparently not carried by water, as both infected and non-infected areas draw their water from the same source. That one man may infect another is also improbable, as in spite of frequent intermarriage, the disease does not spread to the lowlying districts. In the case of children both sexes are equally attacked, whereas male adults seem to be more frequently affected than women. This is possibly due to the protection afforded by the hair to the head and neck, these being the parts that are most frequently attacked. The chief industry consists of sugar-cane and coffee growing, and the workers in these fields seem to be the chief victims of infection. The general course and symptoms of the disease are described. The incubation period seems to extend over about 3 months, causing a cyst-like swelling. When opened the living parasites may be found inside and have been known to remain alive in an unopened cyst for seven years. The only remedial measure advocated is the careful excision of the tumour and its fibrous prolongations, the echnique of which is described. It has so far been successfully carried out in all cases under a local anaesthetic.

These parasites have never been found in the blood stream and appear to be found always in the subcutaneous cellular tissue.

Brumpt (E.). **Une nouvelle Filaire pathogéne parasite de l'homme (*Onchocerca caecutiens*, sp. n.).**—*Bull. Soc. Path. Exot, Paris*, xii, no. 7, 9th July 1919, pp. 464–473, 5 figs.

The parasite causing coast erysipelas in Guatemala is described as *Onchocerca caecutiens*, sp. n. A comparison is made between it and *O. volvulus*, Lenck., from which it is separated chiefly on the strength of biological characters, details of which are given in a table.

Laveran (A.) & Franchini (G.). **Sur quelques Flagellés d'Insectes obtenus en Culture pure et en particulier sur** *Crithidia melophagi*. —*C.R. hebdom. Acad. Sci., Paris*, clxix, no. 4, 28th July 1919, pp. 153–155.

Experiments made to obtain pure cultures of flagellates from insects and to determine their pathogenicity when injected into mammals are described. For this purpose the following species were used: *Herpetomonas ctenopsyllae*, a parasite of the mouse flea, *Ctenopsylla musculi*; *Herpetomonas ctenocephali*, a parasite of the dog flea, *Ctenocephalus canis*; and *Crithidia melophagi* from *Melophagus ovinus*, the Hippoboscid fly infesting sheep. This paper deals chiefly with the last-named species. Details of the technique employed are given. Of six young white mice inoculated twice with *C. melophagi* in the peritoneum, with several days interval, four remained healthy and the others were killed on the 9th and 12th day after the first inoculation, as death seemed to be imminent. The blood examination revealed free parasites. *Leishmania* organisms were found in the blood, liver and spleen of one and in the liver of the other, these organs in both animals being greatly enlarged.

Blacklock (B.) & Carter (H. F.). **The experimental Infection, in England, of *Anopheles plumbeus*, Hal., with *Plasmodium vivax*. (Sporozoites in Salivary Glands.) Preliminary Note.**—*Ann. Trop. Med. Parasit., Liverpool*, xiii, no. 2, 31st July 1919, pp. 187–188.

Specimens of *Anopheles plumbeus*, Hal., were fed on a patient suffering from simple tertian malaria and showing moderate infection of trophozoites and gametes. After the infective feed the mosquitos were fed on raisins and kept in an incubator in glass globes at a temperature of about 28° C. Three died between the third and fifth day after the feed, but no infection was apparent. The fourth which died on the 8th day showed the presence of oöcysts in the gut in an advanced state of development. The other two were killed on the eleventh and thirteenth days, respectively, when infections of gut and salivary glands were found.

Rodhain (J.). ***Filaria pertenue*, sp. n., provoquant une Dermofilariose cheloïdiforme chez** *Cephalophus sylvicultor*.—*Ann. Trop. Med. Parasit., Liverpool*, xiii, no. 2, 31st July 1919, pp. 109–116, 2 plates.

A Nematode, *Filaria pertenue*, sp. n., is described, which was dissected from a tumour on a duyker, *Cephalophus sylvicultor*, in the Belgian Congo. Nothing at all is known regarding the mode of transmission. The anatomical lesions produced are described.

LEFROY (H. M.). **Fly Sprays.**—*Trans. Soc. Trop. Med. & Hyg., London,* xiii, no. 1, 16th May 1919, pp. 1–9. [Received 18th August 1919.]

Extensive work carried out with numerous substances as sprays for flies is described and details of the results are given.

The following formula proved to be the most efficacious: 2 lb. pyrethrum, 1 gal. spirit, 1 gal. safrol and enough soap to make the mixture emulsify (about 10 oz.). This mixture should be diluted at 1 to 30. Although sprays have proved of great value in hospitals and private houses, they are of no use in the open, where the only possible means of fly control is the prevention of breeding.

The above formula failed completely when used in hot climates, but proved effective with the addition of ½ to 2 per cent. of castor oil.

O'CONNOR (F. W.). **An Outbreak of Itch due to a predaceous Mite, occurring in England amongst Men engaged in unloading Cotton Seed from Egypt.**—*Trans. Soc. Trop. Med. & Hyg., London,* xiii, no. 1, 16th May 1919, pp. 10–13, 2 figs.

This outbreak of the mite, *Pediculoides ventricosus*, in 1913 at the London docks, has already been recorded [see this *Review*, Ser. B, ii, p. 163]. The irritation caused in man is probably due to the bite of the mite and its numerous bristle-like hairs, as no individuals were noticed burrowing either in the cases presented for examination or in the experimental ones. The mite is described. Similar infections may arise from sleeping on newly made straw mattresses.

MUNRO (J. W.). **Report of Scabies Investigation.**—*Jl. R.A.M.C., London,* xxxiii, no. 1, July 1919, pp. 1–41, 6 figs.

The observations and experiments detailed in this report deal chiefly with *Sarcoptes scabiei* var. *hominis*, Mégn., which is the variety that most usually infests man, although attacks by var. *equi*, Mégn., var. *capreae*, Mégn., var. *cameli*, Mégn., var. *suis*, Mégn., var. *canis*, Raill., var. *cameli*, Raill., and var. *leonis*, Raill., have been reported at different times.

The variety of mite infesting man is described and its relation to disease is reviewed. Patients suffering from scabies seem especially susceptible to inoculation with trench fever, owing to the continual scratching that it gives rise to. The egg-stage lasts about 2½ to 3½ days, the larval 1½ to 3, the 1st nymphal 1½ to 2½, and the 2nd, 2 to 4. The adults may live 3 to 5 weeks. The eggs, between 40 and 50 in number, are deposited in the burrows made by the female in the epidermis of the host. The larvae on hatching bury themselves in the floor of the original burrow and give rise to vesicles.

Particulars of the first nymphal stage are not known, but the second is found in burrows smaller than those of the adult female and unaccompanied by vesicles. Small pockets may be found alongside of these burrows which frequently contain a male Acarid. It is believed that pairing takes place during this stage.

The mite may be conveyed from one individual to another by body contact, blankets or clothing. The clothing of infested persons may remain infective for at least fourteen days.

In testing the effect of heat and moisture on the mites and their eggs it was found that moderate humidity and temperature are essential to them. This and the fact that exposure in a steam hut to a temperature of 65° C. killed all mites in 25 minutes shows that they may be dealt with by the moist or dry heat methods suggested for louse destruction [see this *Review*, Ser. B, vi, p. 219 etc.].

The chief points in the diagnosis of scabies are quoted, and rules are suggested for the carrying out of routine inspections and the method of examination. The treatment advocated consists of systematic mechanical measures of washing, etc., which aim at rupture of the burrows and consequent exposure of mites and eggs, followed by the application of an acaricide, sulphur ointment 1 in 15, liquor calcis sulphuratae or balsam of Peru being suggested for this purpose.

VINCENT (G. E.). **Review of Work for 1918.**—*Rockefeller Foundation, New York*, 1919, pp. 13–17, 2 figs.

The attempt begun in 1916 to rid a community of malaria was continued in the year under report. The breeding of *Anopheles* in four towns of Arkansas was almost wholly prevented. Medical returns show a reduction in the number of calls varying from 80 to 97·4 per cent. There is every reason to believe that this work undertaken by the U.S. Public Health Service will extend and that in the early future the State will take over the entire responsibility.

In view of the outbreak of yellow fever in Guatemala quarantine was immediately established and prompt measures taken to control the disease. This attempt succeeded by December. A commission was sent to Ecuador to study the bacteriological, chemical and clinical aspects of yellow fever. Much valuable information was obtained and systematic measures are now being taken to eradicate the mosquito (*Stegomyia fasciata*) which is the sole transmitter of the disease.

CHANDLER (W. L.). **Ox-Warbles.**—*Qrtrly. Bull. Michigan Agric. Expt. Sta., East Lansing*, i, no. 4, May 1919, pp. 166–167.

The information here given on *Hypoderma bovis* and *H. lineatum* has previously been noticed [see this *Review*, Ser. B, vi, p. 45 etc.].

ROSS (Sir R.). **Malaria Reduction in Cyprus.**—*Brit. Med. Jl., London*, no. 3059, 16th August 1919, pp. 220–221.

Attention is drawn to the success of the anti-malarial campaign in Cyprus. The number of cases has fallen from 7,342 in 1913 to 2,205 in 1918.

HILDEBRAND (S. F.). **Fishes in Relation to Mosquito Control in Ponds.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 21, 23rd May 1919, pp. 1113–1128, 6 plates, 3 figs.

Investigations as to the importance of fishes as eradicators of mosquito larvae are described. The observations were chiefly directed to determine the value of the top minnow, *Gambusia affinis*. Nearly all the ponds in Augusta, which is the county under consideration, are artificial with sloping shores covered with aquatic vegetation. The newer ponds have steep banks.

All observations show that *Gambusia affinis* should prove a great asset in mosquito control. Wherever it was introduced, the mosquito larvae were exterminated in a very short time, unless sufficient protection was offered by submerged leaves or stems of plants. During these experiments, details of which are given, it was noticed that mosquitos may breed in water so strongly acid that it will instantly kill *Gambusia*. The number of fish required to effect mosquito control in a given pond varies with the conditions, being appreciably smaller where the water is free from aquatic vegetation and other hiding places for the larvae. The plants that afford most protection, and should therefore be removed, are an aquatic grass, *Hydrochloa caroliniensis*, a species of *Myriophyllum* (coon-tail moss) and algae. The latter may be sprayed with oil sufficient to make the masses of them uninhabitable by larvae without killing the fish. Although top minnows are very prolific and multiply rapidly, to ensure their use in mosquito control they must be protected from predaceous enemies such as the large-mouthed black bass. For this purpose shallow hiding places must be provided near the water's edge.

Other fish that might prove useful in mosquito control include the star-headed minnow, *Fundulus nottii*, several species of sunfishes, the roach minnow and the goldfish, the last-named being chiefly suitable for small and artificial waters.

HERMS (W. B.). **Occurrence of Malaria and Anopheline Mosquitoes in Northern California.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 29, 18th July 1919, pp. 1579–1587.

Owing to organised effort and widespread individual action the prevalence of malaria in California has been reduced by 60 per cent. during the past 10 years. In 1916 a resolution was passed that the State Board of Health in cooperation with the University of California should undertake a survey of the State. The object of this was to ascertain the specific occurrence and distribution of mosquitos and malaria, to collect accurate information as to breeding places of Anophelines so as to suggest definite and practical measures for their control, and to ensure cooperation amongst the population by giving lectures, distributing literature and carrying out personal work among the ranches. The work was carried out from April to August 1916, covering 7,036 miles in 31 counties of Northern California and reaching an elevation of 8,000 feet in the Sierra Nevada mountains. During 1917 the survey was frequently interrupted for inspection of military camps and during 1918 completely suspended owing to the war, but its completion is anticipated during 1919.

The mosquitos collected include *A. quadrimaculatus*, *A. punctipennis* and *A. pseudopunctipennis*. The first two were found to comprise about 80 per cent. of the total Anophelines. The latter was the predominant species in the coastal and inland coastal valley counties, but seems to be a very slight carrier of malaria, if one at all, as the average annual rate of disease where this species predominated was 0·9 to 1·4 per 100,000.

A. occidentalis was also found, but is regarded as a melanotic variety of *A. quadrimaculatus*.

ROTHSCHILD (N. C.). **Results of an Expedition to Korinchi Peak, Sumatra.**—*Jl. Federated Malay States Mus., Singapore*, viii, no. 3, July 1919, pp. 1–6, 2 plates.

The fleas collected include: *Ceratophyllus klossi*, sp. n., from a rat, *Rattus inflatus*; *C. idoneus*, sp. n., from a squirrel, *Tomentes tenuis altitudinis*, and a rat, *Rattus orbus fraternus*; *C. sodalis*, sp. n., from a squirrel, *Callosciurus nigrovittatus bocki*; and *Pygiopsylla robinsoni*, Roths., from a tupai, *Tana tana*, and from *Callosciurus notatus*, in Java.

EDWARDS (F. W.). **Results of an Expedition to Korinchi Peak, Sumatra.**—*Jl. Federated Malay States Mus., Singapore*, viii, no. 3, July 1919, pp. 7–59, 4 plates.

The TABANIDAE collected on this expedition include *Chrysops dispar*, *Haematopota irrorata*, *H.* ? *lata*, *H.* ? *unizonata*, *Tabanus optatus* and *T. atrohirtus*.

HUTCHISON (R. H.) & PIERCE (W. D.). U.S. Bur. Entom. **Studies on the Dry Cleaning Process as a means of destroying Body Lice.**—*Proc. Entom. Soc., Washington, D.C.*, xxi, no. 1, January 1919, pp. 8–20. [Received 12th September 1919.]

Experiments were made with a view to determine the efficiency of the dry cleaning process as a means of destroying body lice *Pediculus humanus* (*vestimenti*) in garments. The following is the authors' summary: The open rotary washer system of dry cleaning, when done according to the specifications quoted, is entirely effective in destroying both the active stages and the eggs of body lice and has additional advantages in the cleansing of the garments and absence of shrinkage. The high temperature required in the drying tumbler was found to be essential for the destruction of the eggs. The wash and rinse in gasoline are effective in destroying active stages, but a large percentage of the eggs will survive this part of the process. Gasoline itself is of no value as an ovicide, 18·7 per cent. of the eggs in one test hatched after 54 hours' immersion in gasoline. An attempt to find a washing formula which of itself would be effective without depending on the high temperature of the drying tumbler was not successful, although results of one experiment with benzol, 30·5° Bé. indicated that the oil could be used for this purpose, if infested garments were soaked for 2 to 4 hours before washing. A preliminary soaking in kerosene or in a 52° Bé. kerosene-gasoline mixture followed by washing in gasoline was found in laboratory tests to be ineffective. Laboratory tests with a series of oils showed that benzol (30·5° Bé.) killed after 2–4 hours' immersion; kerosene (44° Bé.) killed within 10 minutes; gasoline-kerosene mixtures (48° Bé. and 52° Bé.) killed after 15 minutes; a 57° Bé. mixture did not kill within 17 hours. Gasoline did not kill all eggs after 54 hours' immersion. When immersion in any of the heavier oils was followed by a rinse in gasoline, hatching occurred. Gasoline-soap emulsion was found to have little killing effect on eggs even after 30 minutes' immersion.

SCOTT (J. W.). **Swamp Fever in Wyoming. Economic Importance, General Characteristics and Control.**—*Wyoming Agric. Expt. Sta., Laramie,* Bull. no. 121, June 1919, 51 pp., 14 plates, 7 figs.

The history, seasonal occurrence and distribution, as well as symptoms, methods of diagnosis and types of this disease of horses are fully discussed.

Great difference of opinion exists with regard to the mode of transmission, but experiments prove that biting flies, of which *Stomoxys calcitrans* and *Tabanus* are specially mentioned, are responsible for the majority of infections, although they may not be the sole transmitting agents. The disease is most prevalent in August and September, a season when these flies are most abundant in Wyoming. No exact figures of the losses incurred are available, but the author believes that not less than 2,000 horses have died of this disease in Wyoming in the last 25 years.

Since the virus of swamp fever has not been discovered and its natural habitat is unknown, no measures of control can be aimed directly at the parasite producing the disease. It has also been found impossible to produce immunity, and, while the symptoms may in some cases be alleviated by the use of certain drugs, no treatment has given more than temporary benefit. Some of the more notable suggestions made by different authors for the control of swamp fever are reviewed. These show a rather close agreement on recommendations of a general nature, differences being due to local conditions or individual opinions regarding the transmission of the disease. From personal observations in Wyoming and in view of suggestions previously made, the author has reached the following conclusions with regard to remedial measures. The diagnosis of suspected cases should at once be entrusted to the State Veterinarian, and all horses suffering from the disease should be immediately killed or isolated. Owing to the fact that the virus can withstand heat, drought, cold and putrefaction, the carcases of all horses that are killed or die of the disease should be burned or buried deeply. If affected horses are not immediately killed they should be segregated, all healthy ones being removed to a new, dry pasture at sufficient distance to prevent the passage of biting flies. The continued isolation of chronic cases is essential. The incubation period being two to four weeks or longer, a careful watch must be kept over all horses that have been exposed to infection; their temperatures should be taken once a day and if any symptoms of the disease appear they should be isolated for further observation.

The most difficult problem in the control of swamp fever is the detection of the chronic and apparently healthy carrier. Japanese authorities recommend that recovered cases that can pass the exercise test without showing any symptom of the disease should be set free. But if the blood is still virulent this plan is not safe; it has been proved that a severe case may arise from a very mild one. Wet, badly drained or swampy pastures should be avoided. A pure water supply should be obtained either from springs or from open running streams. It is advisable to suspend all movements of horses from a swamp fever area during, and somewhat beyond the infective season, from July to December, and quarantine regulations should be enforced to this effect. Disinfection of stables and of the excreta has been strongly

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recommended as a protective measure, but it is the author's opinion that, apart from keeping stables and watering places in a sanitary condition, there is little value in this procedure.

McFadyean (Sir J.). **Annual Report for 1918 of the Principal of the Royal Veterinary College. Parasitic Mange in Horses.**—*Jl. R. Agric. Soc. England, London,* lxxix, 1918, pp. 236–240, 3 figs. [Received 29th August 1919.]

The sarcoptic, symbiotic and psoroptic forms of mange occurring in horses caused by *Sarcoptes scabiei* var. *equi*, *Chorioptes symbiotes* var. *equi* and *Psoroptes communis* var. *equi* are briefly described including general symptoms and treatment. The last-named is the most common in England and can generally be cured by the various dips used against sheep scab ; arsenical dips should be avoided owing to the risk of poisoning by licking.

The sulphur and lime dip has proved successful when applied by means of a spray pump. At least two application with an interval of 8 days are necessary.

The provisions made by the parasitic mange order of 1911 and 1918 are reviewed.

Clark (H. C.). **Piroplasmosis of Cattle in Panama : Value of the Brain Film in Diagnosis.**—*Jl. Infectious Diseases, Chicago, Ill.,* xxii, no. 2, February 1918, pp. 159–168.

Piroplasmosis of cattle is practically speaking universal in Panama where it occurs in the horse, dog, cattle and deer. Investigations of native cattle showed that they are infested in almost every instance with *Piroplasma* (*Babesia*) *bigeminum*, *Filaria*, *Sarcosporidia* and a large trypanosome, probably of a harmless type. In two cattle a spirochaete, probably *Spirochaeta theileri*, was found. Insect vectors are not mentioned but the tropical climate favours tick development.

Descazeaux (J.). **Traitement de la Gale par les Solutions sulfo-crésylées.**—*Rec. Méd. Vét., Alfort,* xciv, no. 12, 30th June 1918, pp. 273–279, 2 plans.

The first tank for dipping horses in sulphur-cresyl solutions was erected at Faverney in January 1915 to the author's specification, and the method has given good results against mange. Constructional details are given of the tank, complementary to which are a rubbing shed accomodating from 12 to 20 horses and a douche shed provided with a warm water supply. The best insecticide formula has been found to be : Cresyl 20, arsenious acid 1, potassium polysulphide 10 and sodium carbonate 10, water 1,000, all parts by weight. Very few cases fail to yield to 6 baths ; the majority are cured after 3 or 4. In winter it is advisable to clip the horses before dipping and again 3 weeks later. Horses in service at the front were partially clipped and washed all over at a 3–4 day interval with the following solution : Cresyl 25 oz., arsenious acid 1 oz., potassium polysulphide 20 oz., sodium carbonate 20 oz., water 50 pints. If the animals are sprayed

instead of washed a great economy of solution results. Three or four applications cure localised or early cases. Animals that present symptoms of elephantiasis are treated with an application containing oil, made as follows: Cresyl 25 oz., arsenious acid 1 oz., potassium polysulphide 20 oz., sodium carbonate 20 oz., water 50 pints. After this solution has been made up, 50 pints of oil are added by shaking. Applications are made every 4 days and the skin is rapidly softened by warm washings with soap. In cases of dermatitis resulting from badly-applied treatment this formula was useful and sometimes the proportion of oil was increased. It is not claimed that these methods of treatment are superior to others in use, but they are simple, economical and certain. The sulphur-cresyl lotion has been effective as a preventive application, nearly all the horses of a division remaining uninfested during the critical period from November to February.

Champetier (—.). **Le Traitement de la Gale.**—*Rec. Méd. Vét., Alfort*, xciv, no. 12, 30th June 1918, pp. 282–286.

The method here recommended for curing horse mange consists in clipping the whole body, which is then sprayed with: Potassium polysulphide 40, sodium arsenate 2, nicotine (or an equivalent amount of tobacco extract) $\frac{1}{2}$, water 1,000, all parts by weight. An ordinary vineyard sprayer is suitable for the purpose. The spray is repeated on the 4th day and again on the seventh or eighth day.

Soulet (—). **Contribution à l'Etude du Diagnostic differentiel et du Traitement de la Gale des Solipèdes aux Armées.**—*Rev. Gén. Méd. Vét., Toulouse*, xxviii, no. 325, 15th January 1919, pp. 1–12.

In treating parasitic mange preliminary clipping, partial or complete, according to the extent of the lesions, has great advantages and it is recommended that all army horses be clipped between 15th October and 15th November, before the cold weather, instead of in springtime. If the horses are not in good condition, improved rations will prevent ill-effects. The use of black (potash) soap for the preliminary washing and of cresyl solutions is not recommended. A warm 4 per cent. solution of sodium carbonate is suitable. The liquid obtained by boiling any wood ash (except that of pine) in water is also satisfactory. The following modification of Helmerich's dressing has given very satisfactory results: Sublimed sulphur 120, sodium carbonate 60, water 60, pea-nut oil 60, lard 350, juniper oil 60, all parts by weight. This ointment is applied, with a two-day interval, to each half of the body. On the day after the application the ointment that has collected at the end of the hairs is gently rubbed in by hand. After 6 days the animal is washed with a 4 per cent. sodium carbonate solution and this washing is repeated on the following day if necessary. If after all these treatments there is some doubt as to the cure being successful, rubbing with potassium polysulphide dissolved in tepid water and then mixed with oil is advised. The internal application of 10–12 grams of sulphur daily for 8–10 days appears to favour the restoration of cutaneous functions.

HENRY (A. K.). **Destruction of Mosquito Larvae in Streams: A thorough and economic Method.**—*Lancet, London*, cxcvi, no. 4995, 24th May, 1919, pp. 908–909.

These suggestions are based on work done in 1916 in an Indian cantonment. It is first of all necessary to reduce the slack water of a stream by canalisation, and each part of the water-surface must then be made accessible to the oil. The method by which this is effected in an economical manner is as follows: Planks of lengths roughly corresponding to the varying width of the stream are used. One is put across and fixed at either end in such a way that one of its edges dips vertically 2 or 3 inches into the water so as to form a kind of surface-dam. Another is similarly placed 15 or 20 yards lower down. Kerosene $\frac{1}{4}$–$\frac{1}{2}$ pint is then poured on to the upper part of the section of the stream between the two planks and is distributed with a sweeping brush over the surface to either bank and made to penetrate the slightest indentation at the edges. When the entire section has been covered with kerosene, a third plank is placed in position 20 yards below the second one, which is then lifted, allowing the surface-film of oil with its accumulation of dead and living mosquito larvae and other insects to pass to the next section, where it is again brought into intimate contact with the edges of the bank by vigorous sweeping. In this way the same oil is used for successive sections. It was found that 1 pint of kerosene oiled 218 linear feet in the case of a stream 6 foot wide, *i.e.*, over 1,300 square feet. The stream was 3,500 feet long, and as only 500 feet had been cleared or canalised at the time, the 16 pints of oil which gave effective results were used under bad conditions. In a properly cleaned and canalised stream less oil is required and half a mile of such water can be oiled and swept in a morning's work by 3 men. The stream should be divided into lengths of 100 paces by numbers. This enables a record of the work to be kept and topographical data may be collected regarding the incidence of any particular species of larva. Apart from streams, areas of water in which the larvae are confined to the edges in the absence of central weed may be treated very economically by driving the kerosene along these edges with a brush; most of the oil can be prevented from escaping to the centre by means of a long board attached to handle, which dips into the water and confines the oil in a kind of temporary channel between it and the bank.

MCDONALD (R. E.). **The Stable Fly.**—*Texas Agric. Dept., Mthly. News Bull., Austin*, ii, no. 3, 1st August 1919, p. 3.

The stable-fly [*Stomoxys calcitrans*] and horn-fly [*Lyperosia irritans*] have very similar life-histories. The measures advocated against them are destruction of the breeding-places, such as manure heaps containing straw or wet stacks, and the use of the following spray: 1 to 2 lb. of soap brought to the boil in 1 U.S. gal. of water; to this 2 U.S. gals. of kerosene are added and when thoroughly mixed a boiled decoction of 1 lb. of tobacco or tobacco stems. For use this spray should be diluted with 9 parts of water.

Metz (C. W.). **Observations on the Food of *Anopheles* Larvae.**—*U. S. Public Health Repts., Washington, D.C.*, xxxiv, no. 32, 8th August 1919, pp. 1783–1791.

Investigations were made with a view to evolving an indirect method of Anopheline control through diminution of the food-supply. It was very soon evident that this would be practically impossible owing to the wide range of suitable food materials. The species dealt with were *Anopheles punctipennis*, Say, *A. quadrimaculatus*, Say, and *A. crucians*, Wied. The range of food materials is so great that no attempt was made to ascertain how many types of animals and plants are concerned. It is also apparently immaterial whether the food consists of living organsims or their dead remains. Experiments, of which details are given, show that the purer and more sterile the water is the more suitable it is for Anophelines provided sufficient food is present. Attention is drawn to the consequent danger of clearing the refuse from sloughs and stagnant puddles unless adequate provision is made for subsequent mosquito eradication.

Bushnell (L. D.) & Jackley (J. G.). **Poultry Diseases.**—*Kansas Agric. Expt. Sta., Manhattan*, Circ. no. 70, October 1918, 21 pp. [Received 3rd September 1919.]

The diseases of poultry here mentioned include scaly leg and depluming scabies due to mites. The usual remedial measures for these as well as for lice are advocated.

Johnson (W. B.). **Domestic Mosquitos of the Northern Provinces of Nigeria.**—*Bull. Entom. Research, London*, ix, no. 4, July 1919, pp. 325–332.

Tables have been compiled from examination of all mosquitos found in the author's bungalow in various localities in the Northern Provinces of Nigeria over a period of six years. It was found that the common mosquitos infesting houses are *Anopheles costalis*, Theo., *A. funestus*, Giles, *A. rufipes*, Gough, *Culex decens*, Theo., and *C. invidiosus*, Theo. These five species together constituted 97·1 per cent. of the total of 11,514 individuals taken during 89 weeks, 17 other species making up the remaining 2·9 per cent. Some of these occur in numbers but are kept under control by the anti-mosquito measures that are practised in most of the stations and to which they are particularly vulnerable owing to their selection of breeding-places. Among them are *Stegomyia fasciata*, F., *Culex duttoni*, Theo., and *Culiciomyia nebulosa*, Theo. At certain stations *Mansonioides uniformis*, Theo., is numerous, and may also be a house-infesting species. Others may be breeding freely in a station, but may not be domestic pests, *e.g.*, *Stegomyia vittata*, Big., *S. unilineata* Theo. (the presence of which should be noted in view of the fact that yellow fever has occurred at Kaduna), and *Uranotaenia ? coeruleocephala*, Theo.

A graph shows the seasonal variation of mosquitos as domestic pests and is considered fairly typical of what occurs in Nigerian stations. *Culex* spp. are most numerous during the hot, dry season before and during the first rains. The numbers of both *Anopheles*

and *Culex* are lowest in January during the period of cold, dry wind; they immediately rise on the cessation of the wind about February and remain high during the hot weather. During the early heavy rains, from May to July the numbers fall, rising again during the steady rains of August and reaching a maximum in October after the cessation of the rains, and then declining steadily during November, December and January.

GEDOELST (L.). **Inventaire d'une Collection d'Oestrides Africains.**—*Bull. Entom. Research, London*, ix, no. 4, July 1919, pp. 333–340.

Among the larvae of Oestrid flies here dealt with are :—GASTEROPHILINAE : *Gyrostigma meruense*, Sjöst., from rhinoceros in northern Nyasaland ; *Gastrophilus ternicinctus*, Ged., taken in Nyasaland and from a zebra in Katanga.

OESTRINAE: *Oestrus interruptus*, sp. n., which appears to be widely distributed, having been taken in Portuguese East Africa, Nyasaland and Uganda in the frontal sinus and nasal cavities of haartebeestes and wildebeestes ; the larva figured by H. H. King under the name *O. variolosus* belongs to this species ; *Oestrus ovis*, L., taken in Zanzibar in the nasal cavities of a goat and in Nyasaland in a sheep ; *O. macdonaldi*, Ged., from the frontal sinus of haartebeestes in northern Nyasaland and Portuguese East Africa ; *O. aureo-argentatus*, Rodh. & Beq., from the same host in Portuguese East Africa and in Uganda in the nasal cavities of *Damaliscus lunatus*; *O. disjunctus*, from Uganda in the nasal cavities of *D. lunatus* ; *Rhinoestrus purpureus*, Brauer, from the Anglo-Egyptian Sudan in the ethmoidal sinus of a mule and also occurring in Algeria, Nyasaland and Morocco; *Gedoelstia cristata*, Rodh. & Beq., from haartebeeste in northern Nigeria ; *G. hässleri*, Ged., from the same host in Portuguese East Africa and Nyasaland, and from the nasal cavities of *D. lunatus* in Uganda ; *Kirkioestrus* (*Kirkia*) *surcoufi*, Ged., taken associated with the last-named species.

HYPODERMINAE : *Dermatoestrus strepsicerontis*, Brauer, infesting the skin of a reed-buck, in the Anglo-Egyptian Sudan, having formerly been recorded as a parasite of the kudu in Cape Colony ; *Hypoderma corinnae*, Crivelli, taken on *Gazella dorcas*, L., in the Anglo-Egyptian Sudan.

COBBOLDIINAE: *Cobboldia loxodontis*, Brauer, parasitic upon elephants in Uganda and the Gold Coast.

A complete list of all the known African parasitic flies of these subfamilies with their hosts is appended.

WESENBERG-LUND (C.). **Bidrag til Stikmyggenes Biologi.** [Contributions to the Biology of the Culicids].—*Naturens Verden, Copenhagen*, iii, 1919, pp. 1–26, 49–67, 150–170, 312–320.

The views generally held on the biology of the Culicids are based upon the knowledge of one species, *Culex pipiens*, whereas most of the others have a different life-history.

Investigations on the Danish species show that *Culex pipiens* hibernates as an adult fertilised female in cellars and elsewhere in houses. In the spring when the temperature reaches about 50° F. it comes into the open to oviposit in old water-casks, water-troughs,

cisterns, etc., near or in houses. Many generations occur in a year, and most of them are domestic in their habitat with the exception of a few of the late summer ones. *Theobaldia* (*Culex*) *annulata* has a similar life-history, but is more rarely met with.

Ochlerotatus (*Culex*) *nemorosus* is the commonest mosquito in Denmark. The larvae are found in the spring in small puddles in beech forests, which become quite dry in the summer. The adult appears in May, and is the common forest mosquito at the beginning of the summer. It does not suck blood until 8 days after emergence. The eggs are deposited in the dry forest ground, and hibernation occurs in this stage. It has only one generation a year. *O.* (*C.*) *ornatus* appears in the spring in company with *O. nemorosus*. The larvae are found from October to November in forests in small pools, often the same as those in which larvae of *O. nemorosus* occur in spring. Hibernation takes place as a larva, but the winter is a critical time and many individuals perish during it. It is undoubtedly a southern species, which is better able to survive the winter in warmer climates. *O.* (*Culex*) *nigripes*, a species common in all arctic countries, must in Denmark be considered to be a relic of the ice age. Its larva is found in October to November in small shallow puddles in spruce forests. The adult appears in December at a temperature of about freezing point, and it passes the rest of the winter hiding in moss, undergrowth, etc. Pairing probably takes place in mid-winter. The larvae of *Ochlerotatus geniculatus* (*Culex lateralis*) live in small collections of stagnant water in holes in trees, especially at the base of old beeches and oaks, and are found from mid-July to the beginning of September. Hibernation must take place elsewhere and in another stage, but the details are unknown. The newly-hatched larvae of *O.* (*Culex*) *cantans* are found in May in small puddles in forests together with the older and therefore larger ones of *O. nemorosus*, and the imago appears two or three weeks after the latter species. It does not suck blood until a fortnight after emergence. Together with *Ochlerotatus* (*C.*) *vexans* this is the common late summer mosquito in the forests. The eggs are laid in the autumn and hibernate.

The larvae of *Ochlerotatus* (*Culex*) *annulipes* are found in ponds filled with vegetation on the edges of forests or in meadows in the spring (May). The adult appears at the end of May. As these ponds dry up in the summer, the eggs must be laid on dry land in the autumn and hibernate. The larvae of *O. annulipes* and *O. cantans* are only separable by their colour, which perhaps is due to their habitat in shaded forest ponds or exposed meadow ones. In *Ochlerotatus* (*Culex*) *vexans*, the larva is found in the spring in flooded meadows. The adult appears in May, and as meadows will dry up in that month, oviposition, which must be supposed to take place in June, must be effected on dry land. The egg-stage is thus very long, lasting through the summer and winter. In certain localities this species is very abundant and especially troublesome to horses. The habits of *Ochlerotatus* (*Culex*) *dorsalis* (a species common in Copenhagen) and *Theobaldia* (*C.*) *morsitans* have not been studied by the author.

Aëdes cinereus is found in very large numbers in damp meadows and marshes. It always remains near the ground and therefore does not bite higher than the knees. Hibernation, according to German

authorities, occurs in the egg-stage. The habits of *Taeniorhynchus* (*Mansonia*) *richiardii* in Denmark have already been recorded [see this *Review*, Ser. B, vi, p. 182]. No Culicine thus lives in lakes or other large waters. The imagines are remarkably stationary, generation after generation remaining in the same forest or farm.

In *Anopheles maculipennis* and *A. bifurcatus*, the larvae are green or brownish according to the character of the water in which they occur during the summer; they are always found near the edges of grass-bordered ponds. *A. maculipennis* hibernates as an adult, fertilised female in outhouses, stables, etc., while *A. bifurcatus* hibernates as a larva, and the adult, which as compared with that of *A. maculipennis* is a true forest mosquito, is found only up to October. The mosquitos of this genus have only one generation a year in Denmark. The habits of *Anopheles plumbeus* (*nigripes*), the third Danish Anopheline, have not been studied.

Bang (B.). **Kvaegymg som Aarsag til Sygdom.** [Simuliids as a Cause of Disease].—*Maanedsskrift for Syrlaeger, Copenhagen*, xxx, 1918, p. 1–32.

In April and May 1918 enormous numbers of Simuliid flies appeared in Jutland, Denmark, coinciding with the sudden occurrence of hot weather. In some districts several deaths among cattle were recorded, in one instance 30 dying in a single district in three days. The author reviews all the known facts about similar outbreaks of Simuliids, including those of an earlier date in Denmark. These have usually been in Jutland, where the largest rivers in Denmark occur. The serious effect of the bites of these flies on cattle must be due to some poison, which especially acts upon the nerves of the heart much as in poisoning with digitalis. In treatment heart-stimulating remedies are therefore of special importance. As a preventive measure the smearing of the less hairy parts of the skin with strongly odoriferous substances such as petroleum or creolin is recommended.

Lomholt (Sv.). **Behandling af Morpioner med "Unguent. hepat. sulphur."** [Treatment of *Phthirus pubis* with Sulphur Ointment.] —*Hospitalstidende, Copenhagen*, 1918, pp. 1306–07.

The author has found sulphur ointment quite reliable in all cases of infestation with these lice, and less injurious than the mercury ointment formerly used.

Lomholt (Sv.). **To Tilfaelde af Dyrefnat paa Mennesker.** (*Cheiletiella parasitovorax.*) [Two cases of Mange in Man caused by *Cheiletiella parasitovorax.*]—*Hospitalstidende, Copenhagen*, 1918, p. 1098.

The mite, *Cheiletiella parasitovorax*, lives normally in the fur of rodents, but the two cases here recorded in man were due to infections from domestic cats. The symptoms were red, itching and raised spots on the neck and limbs.

Hase (A.). **Neue Beobachtungen über das Leben der Bettwanze (*Cimex lectularius*, L.).** [New Observations on the Life of the Bed-Bug.]—*Centralbl. Bakt., Parasit. u. Infektionskrankh., Ite. Abt. Orig., Jena*, lxxxiii, no. 1, 8th April 1919, pp. 22–39, 25 figs.

Eggs are laid by *Cimex lectularius* for some time after the bug has begun fasting. At a temperature of 94°–99° F. (35°–37° C.) none are laid after 7 days, which period increases to 12 days at 71°–78° F. (22°–26° C.) and to 27 days at 59°–65° F. (15°–18° C.). Up to 23 eggs have been laid by a single fasting female. Under optimum conditions a large number of eggs were laid by young females that had been fertilised once; the maximum number of 153 eggs was laid in 36 days, during which period feeding was permitted every 3 or 4 days. The largest number of eggs laid in 24 hours was 12. The maximum number of eggs laid by one female during her entire life-time was 250, but it is thought that this figure may be exceeded. Virgin females can only lay imperfect eggs. Fertilised females lay both imperfect and normal eggs; the imperfect eggs are laid prior to fertilisation or when the supply of spermatozoa is exhausted. In the latter case a fresh fertilisation results in normal eggs being laid. The eggs are laid singly, in heaps, and in rows. The duration of the larval period is shortened to 27 days by abundant food and an optimum temperature of about 85° F. (30° C.). Moulting may be delayed for months if one of these factors is lacking. A still shorter larval period may be possible. The males are more numerous than the females; in bred specimens the proportion was 110 to 100 and in captured ones 128 to 100. The more marked difference in the latter case may be explained by the greater ability displayed by the females in evading capture.

As regards the rapidity with which buildings become infested it is clear that it will be most marked in summer, in rooms that are used both for cooking and sleeping, and in places where the bedding is always warm owing to being constantly occupied. From the practical point of view it is very necessary that measures against *C. lectularius* should be applied as early as possible after its presence is ascertained.

Eckstein (F.). **Zur Systematik der einheimischen Stechmücken. 2. Vorläufige Mitteilung: Die Larven.** [A Contribution to the Systematic Study of Mosquitos native to Germany. Second Preliminary Communication: The Larvae.]—*Centralbl. Bakt. Parasit. u. Infektionskrankh., Ite. Abt. Orig., Jena*, lxxxiii, no. 3, 30th June 1919, pp. 281–294, 18 figs.

The first of these papers [see this *Review*, Ser. B, vii, p. 69] reviewed the classification of German mosquitos and dealt with the females. The larvae form the subject of the present paper, which contains a key to the species with brief notes on each.

Steel (T.). **The External Parasites of the Dingo (*Canis dingo*, Blum.).** —*Proc. Lin. Soc. N.S.W., Sydney*, xliv, no. 173, part 1, 27th June 1919, p. 93. [Received 5th September 1919.]

Parasites taken from a dingo in 1883 in New South Wales have recently been identified as the fleas, *Ctenocephalus felis* and *C. canis*.

A larval tick, which is apparently a new species but very near to *Ixodes holocyclus*, and a louse that appears to be *Trichodectus latus* or a nearly related species were taken from the same animal.

Curlewis (A. W.). **Plans of a Sheep Dip.**—*Jl. Dept. Agric. Victoria, Melbourne*, xvii, no. 7, July 1919, pp. 433–435.

Details for constructing a sheep dipping tank with a diagram and particulars of the cost of erection are given.

Roubaud (E.). **Les Particularités de la Nutrition et la Vie symbiotique chez les Mouches Tsétsés.**—*Ann. Inst. Pasteur, Paris*, xxxiii, no. 8, August 1919, pp. 489–536, 15 figs.

The question of symbiosis in the higher organisms is a much disputed point. The author was led to carry on the investigations described in the present paper in the course of a study of the metamorphoses of *Glossina*, and records his observations of hereditary association between insects and micro-organisms that apparently form an essential factor in their lives. The mode of nutrition during the larval and nymphal stages is described; the rôle of leucocytes in the nutrition of the nymphs and the evolution of adipose tissue is discussed, as well as the conditions of nutrition of the adult.

The examination of three species of pupiparous Hippoboscids having no close association with *Glossina*, namely, *Melophagus* sp., *Lipoptena cervi* and *Hippobosca equina*, L., revealed the intra-cellular presence of symbiotic organisms in the intestinal tract and confirmed the hypothesis of a connection between blood-sucking and pupiparous habits, and it may be considered that similar symbiotic relations exist in the case of all Diptera having conditions of nutrition and reproduction analogous to those of the tsetse-fly. All pupiparous Diptera are provided with intestinal symbiotes and are strictly haemophagous, these three characteristics having a distinct inter-relation. Without the intervention of the symbiotes in the digestion of blood taken in by the fly, the elements of water would not be present in sufficient quantity to allow of an exclusive diet of blood. The natural result of this symbiotic haemophagy is pupiparity. It is readily understood that such a condition, in which the insect is supplied with a uniform, rich and easily-obtained nourishment, admits of larval development in the uterus, and also enables the fly to limit its hosts to a few vertebrates. These flies, although entirely independent of their hosts except at the moment of feeding, and living entirely apart from them, are nevertheless as strictly parasitic as permanent ectoparasites; this exclusive diet also explains the particular rôle played by *Glossina* in the evolution of trypanosomes and other blood parasites.

Zabala (J.), Rosenbusch (F.) & Gonzalez (R.). **Sección Bacteriología y Veterinaria.**—*Mem. Trabajos realizados por el Inst. Biológico, Soc. Rural Argentina (May 1917-April 1919), Buenos Aires*, 1919, pp. 3–31.

Certain cattle destined for the Chaco territory were treated with inoculations of blood parasites from animals native to the territory with the object of rendering them immune to tick fever. It

is hoped that the cattle sent out may prove immune to the attacks of *Boophilus annulatus microplus*, the tick that transmits the disease.

Auricular mange in rabbits, caused by *Psoroptes cuniculi*, frequently destroys the drum of the ear and causes fatal lesions in the middle and inner ear. Treatment with oil or disinfectant solutions and the removal of the various crusts that have formed in the ear have been found to give excellent results.

The Cattle Tick sweeps onward in Australia and inflicts heavy Losses.—*Science & Industry, Melbourne*, i, no. 3, July 1919, pp. 139–140, 2 maps.

A comparison is made between the tick infested areas of Australia and the United States, of which maps are given. Whereas in the latter country the tick [*Boophilus annulatus*] is being steadily pushed back, in Australia it has been gradually spreading. In Queensland the losses from tick fever alone have been estimated at £7,000,000.

Cleland (J. B.) & Somerville (B. M.). **The Distribution in New South Wales of Worm Nodules in Cattle due to** *Onchocerca gibsoni*. —*Science & Industry, Melbourne*, i, no. 3, July 1919, pp. 179–182.

Further investigations have been made with regard to worm nodules in cattle due to *Onchocerca gibsoni* [see this *Review*, Ser. B, vii, p. 14]. In New South Wales the dry western type of country and the moist coastal climate, whether on the slopes or the inland plains, seems to be more favourable for worm-nest infestation in the north of the State than in the south.

Williams (T. H.). **Lice and Mange Infection of Pigs.**—*Jl. Dept. Agric. South Australia, Adelaide*, xxii, no. 12, July 1919, pp. 969–971, 4 figs.

The remedial measures advocated for the treatment of mange in pigs due to *Sarcoptes scabiei suis* are thorough scrubbing with soft soap and water and the subsequent application of lard and sulphur. Several applications will be needed for badly infested animals. The same application with the addition of kerosene may be used against the eggs of the pig louse, *Haematopinus suis*.

Taylor (T. H.). **Report of Entomologist, 1st July to 15th September 1918.**—*Australian Inst. Trop. Med., Townsville, Queensland, Half-Yrly. Rept., 1st July–31st December 1918*, 9th July 1919, pp. 14–15. [Received 12th September 1919.]

The mosquitos collected during the malaria survey of the Innisfail District include: *Anopheles* (*Nyssorhynchus*) *annulipes*, *Culex concolor*, which has previously been recorded as *C. tigripes*, a species that does not exist in Australia. *Stegomyia quasiornata*, *Finlaya*

poicilia, Pseudoskusea multiplex, Mansonoides uniformis, a new species of *Lophoceratomyia* found in crab-holes, *Culex fatigans* and *Stegomyia fasciata.*

WANHILL (Lt.-Col.). **Relapsing Fever : A rough but effective Method of dealing with the Louse in India.**—*Jl. R.A.M.C., London,* xxxiii, no. 2, August 1919, pp. 178–180.

A simple method of dealing with lice infestation, which proved successful in India during an outbreak of recurrent fever, is recorded. All the men of a mule corps depot, being badly infested, were marched to a river twice daily to wash themselves and their clothes. Having washed their garments, these were placed on the hot sand to dry in the sun, then taken to another spot and well shaken. The sand, under the mid-day sun, was too hot to touch with the hand ; the living lice were therefore removed by the washing and killed by exposure to the sun, while the eggs were desiccated by the same agency. The men's tents were each day turned inside out and exposed to the sun. Whenever caste permitted, the hair was cut short and the head scrubbed in the river. By these simple methods infestation was stamped out.

MANSON (Capt. J. K.) & THORNTON (Capt. L. H. D.). **East African Relapsing Fever.**—*Jl. R.A.M.C., London,* xxxiii, nos. 2 & 3, August & September 1919, pp. 97–116 & 193–216, 2 plates, 20 charts.

These notes and observations are the result of examination of some 1,500 cases of relapsing fever among natives of almost every tribe in East and West Africa. Europeans when exposed to infection very readily acquire the disease, which in their case runs a severe and protracted course ; probably however owing to the care taken to avoid infection cases among them are rare. West African natives show a very considerable liability to infection and contract the disease even in quarters that are but lightly infested with *Ornithodorus moubata.* The type of disease is very similar to that observed in Europeans, though severe complications are seldom met with. The readiness and severity with which West African natives acquire the disease in East Africa, particularly when contrasted with the comparative immunity of certain East African groups, rather indicates the possibility of the East and West African fevers being due to distinct spirochaetes. East African natives on the whole take the disease in a modified or less severe form. Natives living along the coastal areas and caravan routes seem to have gained a large degree of immunity by the time adult life is reached.

The relation between the disease and the distribution of *O. moubata* is very marked. Wherever the tick occurred cases of the disease were always found, and an increase of the former was observed to precede any large increase in the cases of disease. The possibility of there being other carriers of the fever is not denied. While numbers of fleas, lice and bed-bugs have been examined microscopically without any trace of *Spirochaeta* (*Spirillum*) *duttoni* being found, it is possible that infection may be directly conveyed by the bite of any of these insects from an infected to a non-infected person. The same may be true for biting flies and mosquitos, though there is no evidence of the

organism maintaining its existence in these insects for any length of time.

The eggs of *O. moubata* are deposited in the sand, for preference on the loose sandy floors of native huts; from 100 to 300 eggs are laid by each female, in batches at short intervals, the young ticks appearing after an interval of about 16 days. On an average, about 30 per cent. of ticks examined from various localities were found to harbour *S. duttoni*. The incubation period of the disease is not definitely known, but appears to be frequently shorter than the generally accepted period of 10 days. The clinical aspect of the disease is discussed, and malaria as a complication of relapsing fever is considered. The two sometimes exist simultaneously without any relationship to one another; in other cases they bear a definite relationship, malarial rises of temperature only occurring during or immediately following a spirillum relapse.

Prophylaxis is best considered from two points of view, namely, for the European and for the native. For the European in permanent quarters the risk of infection in East Africa is practically *nil*, the possibility of *O. moubata* gaining access to such quarters undetected being very small. It is while travelling about the country that the majority of cases occur. Precautions against this means of infection include the avoidance of native houses, especially at night, and of camping grounds that have been used in the past by natives. As the tick has been known to survive for as long as four years without food, the sites of old camps remain infected for a very considerable time. If the necessity for sleeping on such ground should arise, a mosquito net should invariably be used; as the ticks have a marked antipathy to light, the presence of a lamp by the bedside will assist in warding them off. Blankets that have been carried by native porters should always be searched for ticks before being used.

The prevention of the disease among natives is a much greater problem, largely owing to their apparent indifference to the presence of ticks, although they are aware of their noxiousness. Examination of native huts showed that ticks were usually hiding in the loose sand of the flooring during the day-time, especially around the supporting poles where the sand is particularly loose; the ticks were never found at a depth of more than six inches. The provision of a hard floor, impermeable to the tick, is obviously the first essential. Concrete being impossible, a good substitute was found in ant-heap earth beaten hard to a depth of about four inches and then covered with cow-dung spread over the surface in a liquid condition to the depth of half an inch, the surface afterwards being treated once weekly with a watery solution of cow-dung. This gives a hard, even surface and can be brushed over very cleanly every day. Only a few of the ticks thus driven from their usual hiding place took shelter in the roofing, and in no case seemed to oviposit there. The question of eggs is important, since ticks infected with *S. duttoni* remain infective throughout several generations. A reward of about one-sixth of a penny for each example of *O. moubata* resulted in the production of over 30,000 ticks from a single camp in one month. By strict enforcement of simple measures the incidence of relapsing fever was very markedly reduced, and in several smaller camps the disease disappeared entirely.

Cattle Tick Eradication.—*Arkansas Univ. Agric. Expt. Sta., Fayetteville*, Bull. 158, December 1918, pp. 55–56. [Received 12th September 1919.]

The tick eradication work in 1918 covered an area of 35,146 square miles. The area under quarantine for the year under review was reduced to 18,897 square miles from the 33,669 square miles quarantined in 1917. The work included the use of 3,509 tanks through which 91,247 herds were passed, making a total of 3,227,170 of cattle dipped.

Tick Eradication Laws.—*Arkansas Univ. Agric. Expt. Sta., Fayetteville*, Bull. 160, 1919, 14 pp.

The tick eradication laws of Arkansas since 1899 are reviewed, including ordinances regulating the movement and transportation of live stock, regulations for the prevention of contagious diseases among live stock and for the eradication of ticks, and a proclamation made in 1918 to include certain districts in the quarantine area. Several new rules and regulations have been made with regard to the infested and special quarantine area, to become effective on and after 1st March 1919. Formulae for self-boiled arsenical dips are appended.

Carter (H. R.). **The Malaria Problem of the South.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 34, 22nd August 1919, pp. 1927–1935.

The bulk of the information contained in this paper has been previously noticed [see this *Review*, Ser. B, vi, p. 168]. During the past three years investigations have been made to ascertain the effects of large bodies of impounded water on the incidence of malaria. Much work has also been done to spread information about malaria and its control among the public, great importance being attached to this.

Ritchie (A. H.). **Annual Report of the Government Entomologist for 1918–1919.**—*Jamaica Dept. Agric., Ann. Rept. Year ended 31st March 1919, Kingston*, 1919, pp. 26–30.

The practice of dipping cattle for tick control is growing in favour in Jamaica. A 2 per cent. solution of arsenious oxide used at a two weeks interval has proved most efficacious. Weaker solutions may be used at shorter intervals, *i.e.*, ·08 at three-day and ·16 at seven-day intervals. Where hard water is used, it is recommended to increase the quantity of Paranaph from 3 to 3½ lb. for each 2 lb. of arsenite of soda, thus reducing the risk of injury to the skin.

Ox warbles, *Hypoderma bovis*, were found on cattle imported from the United States during the previous autumn, but the pest was kept under control by the systematic application of dressings.

Bodkin (G. E.). **Bites and Stings.**—*Jl. Brit. Guiana Bd. Agric., Georgetown*, xii, no. 2, April 1919, pp. 94–101. [Received 22nd September 1919.]

This popular account of biting insects, etc., in British Guiana records a tick, probably *Amblyomma americanum*, L., the bite of which causes intense irritation and swelling, and often produces ulceration. Applications of kerosene oil or gasolene cause the tick to drop off in the course of time. *Trombidium* sp., a mite known as "bête rouge," causes intense irritation often resulting in blood poisoning and nervous exhaustion. Attacks may be prevented by the application of grease to the feet and legs as far up as the knees before traversing grass-land suspected of harbouring these mites.

Tabanid flies include *Chrysops tristis*, F., *Diachlorus scutellatus*, Mcq., *D. curvipes*, F., and *Dicranomyia cervus*, Wied. Mosquitos include *Stegomyia fasciata*, F. (*Aëdes argenteus*, Poiret) and *Taeniorhynchus* (*Mansonia*) *titillans*, Theo. *Pulex irritans*, L., is very abundant in Indian camps in the far interior. *Phthirus pubis*, L., is also found in abundance among natives.

Jack (R. W.). **Operations against Tsetse Fly in Southern Rhodesia.**—*Rhodesia Agric. Jl., Salisbury*, xvi, no. 4, August 1919, pp. 292–298, 1 map.

Investigations with a view to ascertaining the possibility of checking the advance of tsetse-fly [*Glossina morsitans*] in Southern Rhodesia are being carried out during 1919, including organised shooting operations. The various possible methods of combating the fly are discussed [see this *Review*, Ser. B, vii, p. 9] and conditions governing the selection of the adopted measures are described [*loc. cit.*, p. 36]. A map is given showing the recent advance of the fly along the Shangani river and indicating the boundaries of the organised and free shooting areas.

Sinclair (J. M.). **Veterinary Report May-June 1919.**—*Rhodesia Agric. Jl. Salisbury*, xvi, no. 4, August 1919, pp. 348–349.

A fresh centre of infection of African coast fever was recorded in the Melsetter district. In the Gwelo district a serious outbreak occurred involving 293 head of cattle that died or had to be destroyed.

Hopkirk (C. S. M.). **Louse infesting the Legs of Sheep.**—*N.Z. Jl. Agric., Wellington*, xix, no. 1, 21st July 1919, pp. 15–16.

Haematopinus pedalis is reported from New Zealand as infesting the legs of sheep. The same louse was found on sheep in 1911 but was then recorded as *H. microcephalus*, this name being a synonym. It has seldom been noticed since. Eggs were found adhering to the first locks of wool above the hock of the hind legs. The lice do not apparently interfere with the general condition of the sheep and there is very little irritation. Unaffected sheep become infested

when placed in contact with infested animals. The louse does not as a rule live longer than a week away from its natural host. The remedial measures advocated are dipping as for other species of lice.

REAKES (C. J.). **Control of Animal Disease in New Zealand.**—*N.Z. Jl. Sci. & Technol., Wellington*, ii, no. 4–5, July 1919, pp. 258–259. [Received 23rd September 1919.]

Important factors in connection with the unusual freedom from serious animal diseases in New Zealand are the precautionary measures adopted to prevent the entrance of disease and the enforcement of systematised local control of existent ones.

The parasites recorded as occurring in the country are: the Hippoboscid fly, *Melophagus ovinus*, which is kept in check by dipping; the ticks, *Haemaphysalis punctata* and *Ixodes ricinus*; and the bot-flies, *Gastrophilus intestinalis* (*equi*) and *Oestrus ovis*.

MILLER (D.). **The Status of Entomology in the Economy of the Dominion.**—*N.Z. Jl. Sci. & Technol., Wellington*, ii, no. 4–5, July 1919, pp. 269–273, 1 fig.

Recent observations show that a number of mosquitos have been introduced into New Zealand, and there is every possibility of *Stegomyia fasciata*, which carries yellow fever, or some of the carriers of malaria becoming established in the country. Of the four factors necessary for the spread of malaria, the blood parasite, man, favourable breeding environment and Anopheline mosquitos, the first three are already existent in New Zealand, and the return of troops suffering from malaria increases the danger.

Estación Nacional de Desinfección y Profilaxis general de Catamarca: Su Inauguración.—*Anales Dept. Nac. Higiene, Buenos Aires*, xxv, no. 2, March and April 1919, pp. 7–20, 5 figs. [Received 20th September 1919.]

In accordance with an extensive scheme of prophylaxis for the whole of Argentina, planned by the National Department of Hygiene, a national station for disinfection and general prophylaxis has been opened at Catamarca, this being the first establishment of its kind in Argentina. Among the decrees issued are a number of regulations concerning the destruction of flies. Inspectors will visit private houses and all other establishments to ensure the carrying out of measures for fly destruction.

BARBIERI (A.). **El Problema de Saneamiento antimalárico en la Argentina.**—*Anales Dept. Nac. Higiene, Buenos Aires*, xxv, no. 2, March–April 1919, pp. 21–37. [Received 20th September 1919.]

The chief sanitary methods essential for the reduction of malaria are reviewed, and the allocation of the various measures to the different Boards of Works and Sanitary Services is described. It is estimated that a sum of approximately £30,000 to £40,000 should be included in the annual national budget for anti-malarial sanitation.

IRIGOYEN (A. C.). **La Medicina social en la Argentina: La Acción del Estado.**—*Anales Dept. Nac. Hygiene, Buenos Aires*, xxv, no. 2, March-April 1919, pp. 39–54. [Received 20th September 1919.]

In reviewing recent sanitary and hygienic measures promulgated by law in Argentina, mention is made of the fact that a population of some 500,000 persons lives in danger of malaria, and that as a result of prophylaxis the index of mortality within the last five years has fallen from 24·7 per cent. in 1910 to 11·9 per cent. in 1915.

BRÈTHES (J.). **El *Pulex irritans*, L., Parásito del Cerdo.**—*Anales Soc. Rural Argentina, Buenos Aires*, liii, no. 10, July 1919, pp. 443–444, 1 fig.

Several examples of *Pulex irritans* have been collected from piggeries in the south and west of the province of Buenos Aires. This flea, which has previously been recorded only from man, dogs and cats, is very abundant on pigs in Argentina, particularly upon sucking-pigs, the larvae being found in the bedding. *Dermatophilus penetrans* appears to be the only other flea that has previously been recorded as infesting pigs. It is suggested, with a view to exterminating these parasites, that the pig-styes should be constructed of cement as far as possible and should be kept very clean.

KRAUS (R.) & ROSENBUSCH (F.). **El Dengue en la Republica Argentina.**—*Rev. Inst. Bacteriológico, Buenos Aires*, ii, no. 2, June 1919, pp. 221–223. [Received 24th September 1919.]

Dengue has not previously been recorded in Argentina. In February 1916 information was received of an epidemic having broken out at Concordia and at Salto, on the opposite Uruguayan bank, where almost the entire population was attacked. It was suspected that the disease was brought direct from Spain, and a noticeable fact was the prevalence of mosquitos, which had not been so numerous for many years. The method of transmission of the disease is problematical; persons travelling to Buenos Aires and Montevideo were attacked without it being possible to discover any contact cases in the houses or hotels in which they had stayed, and although individuals suffering from the fever arrived at these towns, no epidemic occurred there. No experiments with mosquitos could be carried out in either town.

At Concordia almost every house was a breeding-place for mosquitos the species found being *Culex fatigans*, Wied., and *Stegomyia fasciata*, F. (*calopus*); *Taeniorhynchus* (*Mansonia*) *titillans*, Wied., was also collected, but *Phlebotomus* was not discovered. There is evidence that dengue existed in Argentina years ago in endemic form, and will probably extend into those regions where its transmission by *C. fatigans* and *S. fasciata* is possible. Guinea-pigs inoculated with the blood of dengue patients showed no symptoms of the disease.

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Bertrand (G.), Brocq-Rousseau & Dassonville. **Destruction de la Punaise des Lits (*Cimex lectularius*, L.), par la Chloropicrine.**—*C. R. hebdom. Acad. Sci., Paris*, clxix, no. 9, 1st September 1919, pp. 441–443.

Successful experiments as to the value of chloropicrin gas against bedbugs, *Cimex lectularius*, are described. A dose of $\frac{1}{6}$ to $\frac{1}{3}$ oz. to about 36 cubic feet proved the most satisfactory. This kills all insects, but should any of the eggs escape, the treatment should be repeated within 2 weeks.

Miyashima (K.) & Okumura (T.). ***Trombidium akamushi* and similar Mites from Japan, Korea and Formosa.**—*Saikin Gaku Zassi* [*Jl. of Bacteriology*], no. 266, 10th November 1917, pp. 893–908. [Abstract in *China Med. Jl., Shanghai*, xxxiii, no. 4, July 1919, pp. 371–374, 3 plates.]

The mites from Korea here dealt with were obtained from the ears of wild rats, and are separable into two classes having either short or long hairs on the body. The opinions of various authors are discussed as to the particular mite that is the true carrier of Japanese river fever. The examination of 1,539 individuals collected by the author revealed no intermediates, and they were sharply differentiated into the two species or dimorphic forms. It is considered probable that the short-haired form is a result of seasonal dimorphism in the hot climate of Formosa and also Japan and Korea, where the temperature during certain months is high. *Leptus autumnalis*, Shaw, occurring in Formosa, is considered to be the same species as that described from England. *Trombicula mediocris*, Berlese, a similar form in Formosa, is closely related to *Trombicula* sp., reported from Java, but is decidedly different from the adult of the red mite, *Trombidium akamushi*.

Brandt (F. R.). **Report of the Veterinary Department for the Year 1918.**—*Ann. Rept. Agric. Dept. Northern Provinces, Nigeria, 1918, Lagos*, 29th May 1919, pp. 7–11. [Received 25th September 1919.]

The individual belts of *Glossina* in the Northern Provinces of Nigeria have not yet been definitely located, but in addition to known infested areas most of the country south of a line drawn east and west from about 20 miles south of Zaria must be regarded as probably fly-infested, especially in the rainy season. Cattle transferred there from fly-free areas have developed trypanosomiasis more than three months after arrival, indicating that infection must have been contracted locally. Several cases of unidentified diseases, affecting cattle about two months after their migration for the dry season to southern areas, have come under the notice of the veterinary department, and subsequent examination of blood showed the presence of trypanosomes of the *vivax* type. Two outbreaks occurred in Northern Zaria among herds that had not moved for the dry season. As careful search for tsetse-fly gave negative results, the transmission must be attributed to other biting flies, which are common. The conditions described for cattle apply equally to horses.

PILLERS (A. W. N.). **On the Occurrence of *Aleurobius farinae*, De Geer, in Skin Scrapings of Horses.**—*Vet. Record, London*, xxxii, no. 1619, 19th July 1919, pp. 22–23, 1 plate. [Received 27th September 1919.]

It has long been known that mites other than those that are recognised as the actual cause of mange and allied conditions are found upon the skin of man and domesticated animals.

Glyciphagus domesticus has been recorded as a causal parasite of scab in sheep and *Aleurobius farinae*, which has a wide distribution [see this *Review*, Ser. A, vii, p. 91], has been found on the skin of horses alone, as well as in company with *Sarcoptes* and occasionally with *Psoroptes*. Under certain conditions in addition to the ordinary nymph a hypopial nymph is developed, probably for the purpose of distribution. Several such forms have been found by the author in equine skin scrapings and they are often plentiful in lofts. Newstead and Duvall's description [*loc. cit.*] of this form is quoted.

SWELLENGREBEL (N. H.) & SWELLENGREBEL-DE GRAFF (J. M. H.). **Description of the Anopheline Larvae of Netherlands' India, so far as they are known till now.**—*Meded. Burgerlijk. Geneesk. Dienst Nederl.-Indië, Batavia*, 1919, Deel 6, 48 pp., 32 plates.

The external anatomy of the Anopheline larvae of the Dutch East Indies are described and illustrated. Two keys for determining the larvae are given: one, a dichotomic key for experts, covers all the Dutch East Indian species and their varieties; while the other, adapted to students less well acquainted with the subject, is restricted to the commoner larvae in their typical form.

Descriptions are given of the following species, including varietal forms, named and unnamed. *Anopheles* (*Myzorhynchus*) *umbrosus*, Theo., is found in slowly running or stagnant clear water, shady places being preferred. Its variety is always found in brackish or salt water in or near nipa and mangrove swamps and is more partial to shade than *A. ludlowi*, with which it is often found. *A.* (*M.*) *sinensis*, Wied., is very common near dwellings, as well as at a distance from them in muddy water in rice-fields; it does not avoid brackish water or sunny situations. A. (*M.*) *barbirostris*, Wulp, is very common both near and away from dwellings and also in rice-fields where the water is clear and vegetation is present. Salt water and sunny places are not avoided. *A.* (*M.*) *barbirostris* var. *pallidus*, n., is rare in slowly running water, jungle springs and rice-fields. *A.* (*M.*) *albotaeniatus*, Theo., occurs in jungle streams with slowly running, rather muddy water containing fallen leaves, etc. An unidentified larva was found in the island of Noesa Kembangan in running streams in mountain jungle. Another unidentified larva was taken in sunny rice-fields on the Karoo plateau by Prof. Schüffner and is possibly that of *A.* (*M.*) *gigas* found there as an adult. *A.* (*Stethomyia*) *aitkeni*, James, occurs in sunny or shaded small jungle streams and in very quickly flowing water both in low and hilly country. *A.* (*Myzomyia*) *aconitus*, Dön., is found in marshes, rice-fields and fish-ponds with clear water and also in running water; it is more common in rice-fields that are cultivated than in uncultivated ones and occurs both in sunny and

shaded situations. A variety of *A. aconitus*, found in positions often much exposed to the sun, is more common than the typical form in running water; in the other breeding-places the type predominates. No information regarding breeding-places is given in the case of the larva of *A.* (*M.*) *minimus*, Theo., which closely resembles that of the above variety of *A. aconitus*. *A.* (*Nyssorhynchus*) *maculatus*, Theo., is a hill-species and its commonest breeding-places are hill-streams and their springs, but it also occurs down to the sea-shore, even in somewhat brackish water. *A.* (*N.*) *karwari*, James, has the same breeding-places as *A. maculatus*. *A.* (*Neomyzomyia*) *leucosphyrus*, Dön., occurs in stagnant shady pools in jungle and among nipa palms in coast villages; it does not breed in brackish water. *A.* (*Myzomyia*) *indefinitus*, Ludl., is a muddy-water Anopheline found in wagon-tracks, buffalo wallows etc. It is common in sunny situations and occurs with *A.* (*Myzomyia*) *ludlowi*, Theo., in brackish water, but is not so pronounced a salt-water breeder. Near the coast *A. ludlowi* and its varieties generally avoid dirty water and do not require shade. Inland it has been found in fish-ponds in the mountain valleys in the west of Sumatra, in the Lake of Manindjau and near Bandoeng, Java. Two types of *A.* (*M.*) *rossi*, Giles, occur (one resembling the larva of *A. ludlowi* and the other that of *A. indefinitus*) in the same breeding-places as *A. ludlowi*, but penetrate oftener and further inland. *A.* (*Neomyzomyia*) *punctulatus*, Dön., is less common in very dirty water than *A.* (*Cellia*) *kochi*, Dön., or *A. indefinitus*. Sunny and shady breeding-places are equally common. *A. kochi*, Dön., is a true dirty-water species; it is rare in salt water and shows no preference for either sun or shade. The breeding-places of a number of species are shown in tabular form, the relative frequency of the different larvae being indicated.

Gabriel, Bertrand & Dassonville. **Sur le Traitement de la Gale des Equidés par les Vapeurs de Chloropicrine.**—*C.R. hebdom. Acad. Sci., Paris*, clxix, no. 10, 8th September 1919, pp. 486–489.

The methods of treating mange in horses during the War by means of fumigation are described [see this *Review* Ser. B. vi, p. 42]. Owing to the many drawbacks of this treatment experiments were undertaken with chloropicrin gas. The animals were placed in chambers similar to those used for sulphurous anhydride, and chloropicrin was sprayed into them by means of a syringe at the rate of 1 oz. to each 50 cub. ft. Care must be taken not to spray directly on to the skin of the horse as this gives rise to irritation. Horses thus treated were left in the chamber for 30 minutes and the treatment was repeated in about 2 to 3 weeks time. The head is treated with ointment containing 100 parts by weight of vaseline to 2½ by weight of chloropicrin. This treatment has proved entirely successful.

Mitter (J. L.). **Preliminary Report on an Investigation into the Breeding Places of *Phlebotomus* (*papatasii* and *minutus*) in Lahore.**—*Indian Jl. Med. Research, Calcutta*, vi, no. 4, April 1919, pp. 452–461. [Received 6th October 1919.]

Previous literature on the subject of breeding-places of *Phlebotomus* is reviewed. The investigations here described included the examination of varied material collected from the sides of drains, rubbish

heaps, cellars, dried up cess-pits, damp bricks, manure heaps, disused poultry houses built of bricks and clay, cowsheds, stables, latrines, etc. The bulk of this material yielded negative results, but a few larvae and pupae were found in it and more adults developed from the same material stored in jars. The comparatively small number of larvae and pupae found is probably accounted for by their great similarity to their surroundings rendering detection extremely difficult. The species found were *Phlebotomus papatasii* and *P. minutus*, which apparently complete their life-cycle without an animal host during the preliminary stages. The conditions of breeding-places may vary slightly with different species, but given favourable conditions, such as darkness, a certain degree of moisture and the presence of decaying vegetable matter, the particular site is evidently immaterial. To give rise to favourable conditions, decaying vegetable matter must remain undisturbed for some time, but darkness is not essential for the breeding of *P. minutus*.

MAYNE (B.). **The ultimate Seasonal Infection of Malarial Fever, with the Mosquito Carrier as the Indicator.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 35, 29th August 1919, pp. 1959–1972.

To ascertain the latest date of infection of mosquitos, for use as an indicator to determine the discontinuance of sanitary protective measures against malaria [see this *Review*, ser. 13, B, p. 182], investigations have been carried out in Alabama and Louisiana during 1916 and 1917 respectively.

In Alabama a total of 1,377 individuals of *Anopheles quadrimaculatus* and *A. punctipennis* were collected, of which 709 were examined. The first infected mosquito appeared on 21st September, the last on 15th November, the latter being an individual that had been caught on 1st November and kept at room temperature for a fortnight to allow of maximum development of any parasites present. In this district 200 persons examined gave a malaria index of 18·6% in September. The temperature records for the period during which mosquitos were captured show a range from a minimum of 20° F. to a maximum of 94° F.

The temperature in Louisiana, from August to December 1917, which was the period during which the captures were made, varied from 26° F. to 100° F. A preliminary survey among 250 persons revealed a history index of 83% and a parasite index of 22%. Of 746 mosquitos captured, one infected individual was *A. crucians* and 17 *A. quadrimaculatus*; the last two infected individuals were caught on 20th October and 1st November and were both *A. quadrimaculatus*. The biological conditions generally considered normal for infection continued to the last week in November; biting by Anophelines was reported up to 9th and true hibernation was not noticed until 23rd November. The latest date of infection in mosquitos may be assumed as 1st November in Louisiana for 1917, but this does not apply elsewhere at similar latitudes nor in the same locality for other years.

Similar studies must be carried out in many more malarial zones before generalisations can be made as to the conditions bearing on malarial epidemiology. To ascertain from the knowledge gained from these observations what would be a safe date to discontinue

larvicidal measures, it is suggested that 18 days should be allowed for complete transformation from the larval stage and 12 days for the adult mosquito to become infective ; a total of 30 days may therefore be deducted from the date determined as that of ultimate mosquito infectibility ; should this be the 1st November, oiling and larvicidal measures may be discontinued on the 1st October. The author is not prepared to make any specific recommendations as to the influence of these observations on personal quinine prophylaxis.

Fowler (R.). **The Risk of Malaria in Australia.**— *Med. Jl. Australia, Sydney*, 6th Yr., ii, no. 5, 2nd August 1919, p. 83, 1 chart.

Attention is drawn to the danger of an increase of malaria in Australia owing to the return of infected troops, and the necessity for adopting suitable preventive measures.

Smyth (E. G.). **Report of the Division of Entomology.**— *Ann. Rept. Porto Rico Insular Expt. Sta., Rio Piedras, 1st July 1917 to 30th June 1918*, 1919, pp. 109–129.

The horn-fly, *Lyperosia irritans*, L. (*Haematobia serrata*, Desv.) has caused a heavy mortality in dry years in Porto Rico to the cattle that are so much used in the sugar-cane industry. Remedies suggested are the smearing of cheap grease on the shoulders of cattle and the spraying of dairy herds with a repellent. For the destruction of these flies, the manure should be spread out with a brush drag or covered with chloride of lime to prevent the larvae from maturing. A scheme for introducing the beetle, *Canthon violaceus*, which is an active agent in the quick disposal of cattle dung, into the Island has been frustrated by the War.

Hamm (A. H.). **Observations on the Horse Bot-fly,** *Gastrophilus equi*, F.—*Entomologist's Mthly. Mag., London*, no. 58, October 1919, pp. 229–230.

Attention is drawn to the abundance of the bot-fly, *Gastrophilus equi*, F., in various localities in England during August 1919. This was probably due to the exceptionally fine and hot weather. The mode of oviposition is described.

The Cattle Tick Pest.— *Inst. Science and Industry, Melbourne*, Bull. 13, 1919, 40 pp., 12 figs. [Received 8th October 1919.]

The bulk of the information contained in this bulletin has already been noticed [see this *Review*, Ser. B, vii, p. 12.]. In December 1917, a Board was created to deal with all matters directly pertaining to the control or eradication of ticks [*Boophilus australis*] in Queensland. As a result, four cleansing areas were established. In north Queensland the policy is to prevent tick infestation from spreading southwards. Many new dipping tanks have been erected, cattle are permitted to enter at two places only and all cattle from the north are dipped before entry. In view of the great areas of unfenced country eradication is at present impossible, and the same conditions may be said to exist in the Northern Territory and the Kimberley divisions of Western Australia, a very large area having been proclaimed under quarantine.

In the opinion of the conference held in Brisbane in January 1918, federal activity for the eradication of ticks must take the form of either partial or complete co-operation or federal control; the explanation of these terms and their suitability to various localities is discussed. In New South Wales the commission respecting the administration of the Tick Acts, 1918, decided that eradication could only be effected by the whole matter being placed under federal control.

A summary of the results of researches on tick resistance in cattle is appended [see this *Review*, Ser. B, vi, p. 187, vii, pp. 112, 114].

CLELAND (J. B.). **Eighth Report of the Microbiological Laboratory (Government Bureau of Microbiology) for the Year 1917.**—*Rept. Director-Gen. Public Health N.S.W. for Year ended 31st December 1917, Sydney*, 1919, pp. 144–149. [Received 11th October 1919.]

Although no plague-infected rat has been found at Sydney since 1910, routine measures are taken for the examination of rats and mice, 8,395 being inspected during 1917. The actual numbers of rat-fleas collected each month are given and also expressed as a ratio per 1,000 of rats examined, the results being shown in a chart. The species found included *Xenopsylla* (*Laemopsylla*) *cheopis*, *Ctenopsylla musculi* and *Ceratophyllus fasciatus*.

CLELAND (J. B.), CAMPBELL (A. W.), BRADLEY (B.) & OTHERS. **The Australian Epidemics of an Acute Polio-encephalo-myelitis (X Disease). The Possibility of the Occurrence of an Intermediate (Invertebrate) Host of the Virus**—*Rept. Director-Gen. Public Health N.S.W. for Year ended 31st. December 1917, Sydney*, 1919, pp. 173–174. [Received 11th October 1919.]

Among the insects reviewed as possible carriers of anterior poliomyelitis in affected districts in Australia are the fleas, *Ctenocephalus canis* and *Pulex irritans*; *Cimex lectularius* (bed-bug); *Stomoxys calcitrans* (stable-fly); the mosquitos, *Culex fatigans*, *Culex sitiens* (*Culicelsa annulirostris*), and *Anopheles* (*Nyssorhynchus*) *annulipes*, the last-named being of rare occurrence; Tabanids; head and body lice; *Argas persicus* (fowl tick), which probably occurs throughout the affected districts, but is not known with certainty to bite man in Australia; *Musca domestica*, which is common in houses throughout the affected districts; *Fannia canicularis*; *Musca vetustissima* (bush fly), which is abundant and is attracted by the secretion from the eyes; and the blow-flies, *Anastellorhina augur* and *Pollenia stygia*, which are widely distributed throughout the district and have a predilection for feeding on human faeces as well as infesting live sheep. It was decided, however, that none of these could be looked upon as possible intermediate vectors of the disease.

HOWLETT (F. M.). **Proposals for the Provision of Laboratories and Staff for the Study of Insect Parasitology.**—*Bd. Agric. India, Proc. 1st Meeting Vet. Officers in India* (*Lahore*), *Calcutta*, 1919, Appendix D, pp. 43–45.

This appendix details proposals for the provision of an adequate staff and laboratories for the study of insect parasitology. The

proposal was discussed at the meeting and a resolution was passed in favour of the creation of a separate organisation for the study of the insect parasites of man and animals in connection with the Civil Veterinary Department on the lines suggested.

FRANCIS (E.). **Deer-fly Fever, or Pahvant Valley Plague. A Disease of Man of hitherto unknown Etiology.**—*U.S. Public Health Repts., Washington, D.C.*, xxxiv, no. 37, 12th September 1919, pp. 2061–2062.

The rural population of Millard County, Utah, has in recent years been troubled by a disease caused by the bite of a fly on some exposed part of the body, and giving rise to a septic fever lasting from 3 to 6 weeks. The first case known to have terminated fatally was reported in 1919. Guinea-pigs and rabbits have been inoculated from a typical case of the fever and both developed the disease, which terminated fatally after a few days. Cultures made upon coagulated egg-yolk yielded a growth of small non-motile coccobacilli which reproduced the lesions of the disease in guinea-pigs. This is believed to be identical with *Bacterium tularense* obtained in 1911 in a similar manner from ground squirrels in California that were suffering from a new plague-like disease.

MOUSSU (G.). **La Gale chez les Chevaux.** [Horse Mange].—*Jl. d'Agric. Pratique, Paris*, xxxii, nos. 34 and 36, 25th September and 9th October, 1919, pp. 685–687 and 728–732, 4 figs.

The War has been responsible for a great increase of mange among horses, an inevitable consequence of the crowding together of all grades of horses, frequently in quarters that there was no opportunity to disinfect after the evacuation of the previous occupants, sometimes under conditions of insufficient nourishment and poor shelter. The nature of the malady in its three forms, sarcoptic, psoroptic and symbiotic mange is discussed, and the rôle played by Acarid parasites explained. Summer is the most favourable time for treatment of the disease, the cure requiring from two or three weeks to two months or more. Horses affected with mange should be rigorously isolated from healthy ones, and should not be considered cured until every sign of ill-health has disappeared and everything about them, stables, harness, etc. has been throughly disinfected with cresyl solutions and milk of lime wash. Army treatments comprised sulphur or arsenical baths or fumigation with sulphuric anhydride. The latter method, though excellent, is obviously impracticable on ordinary farms. Many forms of sulphur treatment may be substituted, sulphurated oil probably being the most convenient and rapid in action. Attention is again drawn to the fact that horse mange has been included in the list of notifiable diseases [see this *Review*, Ser. B, v, p. 120].

VAN SACEGHEM (R.). **Observations sur les Trypanosomes des Animaux sauvages.**—*Ann. Méd. Vét., Brussels* lxiv, nos. 9–10, September–October 1919, pp. 298–299.

The author records an observation confirming the fact that wild animals are the reservoirs of trypanosomiasis from which *Glossina* become infected, and proving that trypanosomes taken direct from

wild animals are more virulent than those transmitted by *Glossina*. Blood taken from an antelope (*Cervicapra arundinum*) near Zambi (Lower Congo) was mixed with a citrated isotonic solution and left in a tube all night. The next day it was examined for trypanosomes, but none were found. A native sheep was then given a subcutaneous injection of the citrated blood and after 4 days showed an enormous number of *T. congolense* in the blood, dying on the 6th day. Similar sheep living in regions infected with *T. congolense* and where *Glossina* is present exhibited the disease in a chronic form, with very few trypanosomes in the blood, and with no symptoms of the rapid development exhibited in the experimental case.

CROVERI (P.). **Osservazioni sulla Biologia della *Glossina pallidipes* della Somalia Italiana e sulla Trasmissione agli Animali domestici della Tripanosi detta "Ghendi."**—*Ann. d'Igiene, Rome,* xxix, no. 7, 31st July 1919, pp. 432–447. [Received 16th October 1919].

In Italian Somaliland measures against trypanosome diseases come next in importance to those against rinderpest. No sure method of immunisation or cure exists, and the only possible remedy is to combat the vectors, since the practice of moving herds away from districts infested with them entails the avoidance of rich pastures and a nomadic life unfavourable to stock.

The first observations on trypanosomiasis in Italian Somaliland were published in 1911 by Martoglio, who distinguished three forms: "Ghendi," due to *Trypanosoma somalilense*, transmitted by *Glossina pallidipes*, and common to all domestic animals in the colony; "Gobiat" or "Gumul," due to *Trypanosoma cellii*, transmitted by an unknown Dipteron and affecting bovines; and "Salaf" or "Ducan," due to a trypanosome that Martoglio identified as the agent of surra, (*T. evansi*), and transmitted to camels by an unknown Tabanid.

The present author has confined his investigations to "Ghendi." A less common form of trypanosomiasis that occurs in wooded localities infested with Tabanids and far from rivers appears to be that known as "Salaf."

The observations were made on the middle and lower Shebeli River and probably also apply to the valley of the Juba, as the conditions there are similar. The only species of *Glossina* found was *G. pallidipes*, and experiments showed that this fly was able to transmit the disease. As a period of 17–19 days elapses between the infecting feed and the capacity for transmission, it is probable that the trypanosome undergoes an evolutionary cycle in the fly. The situations preferred by *G. pallidipes* are wooded spots, covered with low, dense bush and near stagnant or slow-flowing water. Such localities are limited in area during the dry season, but extend considerably during the wet season, so that the infested zone is then increased. *G. pallidipes* avoids open and cultivated areas in general, though it is found in banana and rubber plantations and among low trees. On sunny days it bites from early dawn up to about 8 a.m., re-appearing about 4 p.m. and disappearing again at nightfall. On cloudy or rainy days it bites during the whole day, and on bright moonlit nights only if it is disturbed; it does not bite

on dark nights. The natives believe that by day a very loud noise and much dust scare away the fly; this method is adopted when entire herds have to cross a fly-belt, noon being invariably the time chosen. They also have great faith in the repellent properties of a solution of myrrh, but experiments showed that this is not justified. The average life of this fly lasts 3 months. From 7 to 10 larvae are laid at an average interval of 10–11 days. The larva immediately seeks shelter and in the laboratory burrowed into sand to a depth of about $\frac{8}{5}$ of an inch. In nature the pupae are found under the surface soil beneath bushes in places where the earth is dry. They also occur among the roots of trees, banana plants, etc. In the laboratory the pupal stage occupied 28 days on the average. Some pupae kept in a room where the afternoon temperature exceeded 85°F. (30°C.) gave rise to adults in a shorter time. A temperature of about 94°F. (35°C.) is fatal to the pupae, if prolonged. They also die if immersed for some time in water or in very damp soil. It therefore appears that *G. pallidipes* may be combated by clearing the bush near rivers and by building up the river banks so as to prevent flooding. Cleared areas may be converted into meadows, yielding forage for the dry season and affording good grazing, or they may be planted with graminaceous crops or cotton.

Jarvis (F. E.). **On the Occurrence of the Immature Stages of *Anopheles* in London.**—*Ann. App. Biol., Cambridge*, vi, no. 1, September 1919, pp. 40–47. [Received 24th October 1919.]

In an area of about a nine-mile radius with Charing Cross as its centre, thirty-seven pieces of water were examined, including ornamental and natural ponds, swamps and ditches, for the presence of immature stages of Anophelines. *Anopheles maculipennis* was found in 16 places, *A. bifurcatus* only in one locality, and *A. plumbeus* (*nigripes*) was not found at all. Detailed notes are given of previous records of the occurrence of *Anopheles* in London [see this *Review*, Ser. B, vi, p. 175] and on the finding of immature stages of Culicids including *Culex pipiens*, L., *Theobaldia morsitans*, Theo., *Ochlerotatus dorsalis*, Mg., and *O. nemorosus*, Mg. Many of the localities visited were unsuitable for breeding-places, whilst in certain places negative results were obtained where the conditions were apparently favourable. Further investigation of such localities would be advisable.

Mellor (J. E. M.). **Observations on the Habits of certain Flies, especially of those breeding in Manure.**—*Ann. App. Biol., Cambridge*, vi, no. 1, September 1919, pp. 53–88, 4 charts, 6 figs. [Received 24th October 1919.]

For the control of flies it is considered that the destruction of the immature stages must be relied upon, as measures directed against the adult can never be thorough or permanent, and perfect sanitation cannot be carried out until legislation and education are much improved in the British Isles. In certain circumstances, such as the impossibility of obtaining authority to control the breeding-places or if these are too extensive to be dealt with, the destruction of adults will have to be adopted. Previous literature on the subject of the hibernation of *Musca domestica* is reviewed. During the winters of

1916 and 1917, 45 likely haunts were examined from which the following species were collected from the manure of various animals in addition to those previously recorded by Graham-Smith [see this *Review*, Ser. B, iv, p. 143]: *Sciara* sp.; *Scatopse notata*; *Scatopse* sp.; *Dilophus febrilis*; *Bibio hortulanus*; *B. johannis*; Psychodids; *Tipula* spp.; *Rhyphus fenestralis*; *Sargus cuprarius*; *Chloromyia formosa*; *Microchrysa polita*; *Ascia podagrica*; *Eristalis tenax*; *E. arbustorum*; *Syritta pipiens*; *Tachina* sp.; *Graphomyia* sp.; *Crytoneura caesia*; *Morellia hortorum*; *Anthomyia* spp.; *Phorbia* (*Chortophila*) *cinerella*; *Pegomyia socia*; *Tephrochlanys rufiventris*; *Lonchaea vaginalis*; *Sepsis* sp.; *Borborus equinus*; *Limosina sylvatica*; and *Stenopteryx hirundinis*. Larvae of Dolichopodids were found in soil near cow manure and pupae of *Musca domestica* in horse manure, but adults were not successfully reared. The Chelifer, *Chernes nodosus*, was found in February and in March in dryish cow manure at a temperature of about 95° F. Those found in March were carrying egg-masses. Gamasid mites were abundant in the same heap. Apparently no preference is shown by larvae for any particular portion of a manure heap, but in a few cases they were found in the darkest spots.

The parasites reared include: two Ichneumonids, *Atractodes tenebricosus*, Grav., and *A. exilis*, Hal., and a Figitid from pupae of *Hydrotaea dentipes*; one Ichneumonid from a pupa of *Lonchaea vaginalis* or of *Anthomyia radicum*; numbers of a Proctotrupid, *Diapria conica*, F., were extracted dead from 3 pupae of *Eristalis tenax*.

During the summer and autumn of 1916 observations were made to ascertain the distribution of adult flies in human dwellings and other places both in town and outlying districts, details of which as well as the methods employed are given. *M. domestica* was most abundant in towns and in inhabited farm buildings in the neighbourhood of horse manure, where it was found outside up to 2nd December and indoors up to the end of December. In outlying buildings the majority of Diptera found were *Scatophaga* sp., *Sarcophaga* sp., *Stomoxys* sp., Borborids and Anthomyids. Traps set up at two derelict houses where the surrounding ground of about 30,000 acres had been under water for 9 months attracted 2 *M. domestica*, 1 *Stomoxys calcitrans*, 1 *Pollenia rudis* and 4 *Calliphora erythrocephala*, of which the last laid eggs on the bait.

Experiments made to ascertain the temperature generated in a horse manure heap and the number of flies emerging therefrom show that lightly packed fresh manure reaches the maximum temperature during the first 3 days, after which a fairly rapid but steady fall takes place; 1,141 flies emerged under these conditions. Tightly packed fresh manure registers a superficial temperature similar to the above but the deeper portions retain a higher temperature for a longer time, which eventually drops suddenly; from this 680 flies emerged. Manure loosely thrown up after having been treated incrementally, *i.e.*, spread out in a thin layer and sprayed evenly with about 1 gal. creosote oil mixture to the ton of manure, showed a comparatively lower mean temperature and a quicker fall than in the above experiments. Although the oil did not entirely inhibit the development of flies only 262 emerged. This total of 2,083 flies, of which about 99½% were *M. domestica*, began emerging about the 12th day; the majority appeared in 5 days, but the whole period of emergence lasted about a

fortnight. Cold manure which has finished fermenting does not attract adult house-flies and does not afford nourishment for their larvae, although larvae of other species have been successfully reared from it. Experiments with creosote oil, which are described, show that 4 gals. to the ton proved effective, but the minimum effective quantity was not determined. Incremental treatment proved superior to surface treatment as the larvae of *M. domestica* are able to live between the sprayed layer and the extreme heat at the bottom of the heap. A description is given of the technique employed to ascertain the depth at which larvae-infested material may be safely buried and the results show that a depth of 4 ft. is not sufficient to kill the larvae and 90% of them climb to within a foot of the surface prior to pupation. The species used for this experiment was *Calliphora erythrocephala*.

Page (G. B.). **Experiments with Insectox (a Substance for the Destruction of Flies).**—*Jl. R.N.M.S., London*, v, no. 4, October 1919, pp. 432–436, 1 fig.

To test the toxic effect of "Insectox" on house-flies air-tight boxes were constructed into which a solution was sprayed at a dilution of 1 part Insectox to 20 of water. The experiments described show that a concentration of about $1\frac{1}{4}$ pints per 1,000 cub. ft. is sufficient to kill all insect life in a room exposed to it for about half an hour. Higher concentrations will kill in a shorter time. If the spray is applied direct to the flies and their haunts, a lower concentration should prove effective, but when used as a vapour in the room, flies were apparently moribund after thirty minutes, but recovered after 24 hours exposure to fresh air. Insectox does not damage furniture or ornaments or affect food. In some camps it has been used to spray raw meat in the same way that dilute formalin is sometimes used. Spraying should be commenced early, as soon as the first flies appear, though these methods should only be considered supplementary to the destruction of breeding-places etc. Blow-flies, mosquitos and other small flies are even more susceptible than house-flies to this substance.

Foulerton (A. G. R.). **The Rat as a Carrier of Diseases transmissible to Man and to other Lower Animals.**—*Jl. Comp. Path. Therapeut., London*, xxxii, no. 3, September 1919, pp. 182–191.

In the course of this account of the rat as a carrier of transmissible diseases it is stated that among a series of 98 individuals of *Mus decumanus* (brown rat) examined in London, 41 were carriers of *Trypanosoma lewisi*, 3 were carriers of *Spirochaeta icterohaemorrhagiae*, and one carried both of these parasites. The first-named has never been found as a natural parasite of any other animal than the rat, and shows very little pathogenic activity for other animals; *S. icterohaemorrhagiae* is the cause of spirochaetal jaundice or Weil's disease; while *S. morsus-muris*, a common parasite of the rat, produces rat-bite fever in man.

The association of epidemic prevalence of bubonic plague in man with rat plague is well known; a preliminary outbreak among rats and mice seems to be the invariable precedent to any serious human epidemic. While there is no doubt as to the dissemination of plague

infection among men and among rats by their respective flea parasites, there are differences of opinion as to the exact importance of rat fleas in the transmission of infection from rat to man; it is suggested that infection must frequently be transmitted by means of infected food and dust, especially among bare-footed natives. It is thought also that the rat may play an important part in keeping the virus of plague alive through the winter in temperate climates.

M. rattus and *M. decumanus* are both carriers of the spirochaete of infectious jaundice. A table shows the percentage of carriers detected among rats examined in different parts of the world. On the western front, the infestation of the trenches by rats afforded a sufficient explanation of the prevalence of the disease. In Japan, the disease is particularly prevalent among the workers in certain damp coal mines and among those who work in drains, and Japanese investigators believe that infection of man may be caused by passage of the spirochaete through the unbroken skin. It is certain, however, that infection can be transmitted by means of food also, and the disease may have spread in the rat-infested trenches in this manner.

Banks (C. S.). *Phlebotomus nicnic*, **a New Species, the first Philippine Record for this Genus.**—*Philippine Jl. Sci. Manila*, xiv, no. 2, February 1919, pp. 163–168, 1 plate. [Received 27th October 1919.]

Phlebotomus nicnic, sp. n., is here described for the first time, though its existence has been known for a number of years in the Philippines. It bites mainly at night, and is probably a disease transmitter. It is believed to breed in kitchen drains.

Banks (C. S.). **The Bloodsucking Insects of the Philippines.**—*Philippine Jl. Sci., Manila*, xiv, no. 2, February 1919, pp. 169–189. [Received 27th October 1919.]

This list includes:—the bed-bug, *Cimex lectularius*, L.: the lice, *Phthirus pubis*, L.; *Pediculus humanus*, L.; *Haematopinus tuberculatus*, Nitzsch, which is found on carabaos (buffalos) and may possibly serve as a means of transmission of rinderpest; the eggs, nymphs and adults are apparently able to survive for a considerable period under water, so that submergence of the animal has little or no effect on this parasite; *H. eurysternus*, Nitzsch (cattle louse): *H. urius*, Nitzsch (hog louse); *H. stenopsis*, Burm. (goat louse); *H. spinulosus*, Denny (rat louse); *Pedicinus eurygaster*, Gero. (monkey louse); the Hippoboscids, *Hippobosca equina*, L.; *H. maculata*, Leach; *Olfersia nigrita*, Speis.; *Ornithoctona nigricans*, Leach.

The mosquitos include:—*Culex fatigans*, Wied.; *C. microannulatus*, Theo.; *C. ludlowi*, Blanch.; *Stegomyia fasciata*, F. (*persistans*, Banks); *S. albopicta*, Skuse (*scutellaris*, Wlk.); *Anopheles* (*Myzomyia*) *rossi*, Giles; *A. minimus*, Theo. (*M. febrifer*, Banks); *Aëdes butleri*, Theo. (*Skusea diurna*, Theo.); *Mansonioides uniformis*, Theo.; *M. annuliferus*, Theo.; *Culex* (*Theobaldiomyia*) *gelidus*, Theo.; *Ochlerotatus* (*Hulecoeteomyia*) *pseudotaeniatus*, Giles; and *Toxorhynchites regius*, Tennent (*Worcesteria grata*, Banks). The last-named feeds on plant

juices in the adult stage and as a larva destroys those of other mosquitos. Other biting Diptera include the Tabanids, *Tabanus rubidus*, Wied., *T. striatus*, F., and *Chrysops signifer*, Wlk; a Psychodid, *Phlebotomus nicnic*, Banks, against which the finest mosquito net does not offer any protection; the Muscids, *Stomoxys calcitrans*, L.; *S. nigra*, Macq.; *Lyperosia exigua*, de Meij., which remains upon the host when not feeding and lays its eggs in cattle and carabao dung; *Philaematomyia crassirostris*, Stein, and *P. inferior*, Stein, which are reported to attack cattle; *Simulium* sp.; a Chironomid, *Culicoides judicandus*, Bezzi, which is most abundant during the times of heaviest rainfall.

Fleas include: *Ctenocephalus felis*, Bch.; *C. canis*, Curt.; *Xenopsylla* (*Laemopsylla*) *cheopis*, Roths. (plague flea); *Pulex irritans*, L. (human flea).

Other blood-suckers are a Reduviid, *Triatoma* (*Conorhinus*) *rubrofasciata*, DeG.; *Boophilus annulatus australis*, Fuller (cattle tick); *Dermacentor variabilis*, Say (dog tick), which attacks dogs, cattle, horses, rabbits and man; and a mite, *Trombidium* sp., attacking man, which may be related to *Trombidium* (*Leptus*) *akamushi*, Brumpt, which carries fever in Japan.

Ross (W. A.) & Caesar (L.). **Insects of the Season in Ontario.**—*49th Ann. Rept. Entom. Soc. Ontario, 1918*; *Toronto*, 1919, pp. 23–27. [Received 28th October 1919.]

Several reports have been received of cattle attacked by *Hypoderma bovis* (warble fly), which is apparently becoming more abundant and more widely distributed in Ontario.

Newham (Lt.-Col.). **Trypanosomiasis in the East African Campaign.**—*Jl. R.A.M.C., London*, xxxiii, no. 4, October 1919, pp. 299–311, 1 map.

Although active operations were in progress as early as 1914 in regions of East Africa known to be infected with trypanosomiasis in man, it was not until March 1918 that any instance of this disease was encountered, or at any rate recognised as such. Before the War sleeping sickness was known to occur in certain parts of ex-German East Africa and *Glossina palpalis* was prevalent. In 1910, a case of trypanosomiasis occurred near the junction of the Rovuma and Sassawara Rivers, and, upon search being made for tsetse-flies, *G. palpalis* was not found, but it was finally established that *G. morsitans* is the transmitter of sleeping sickness in that area. The trypanosome shows characteristic differences from *T. gambiense* and is identical with *T. rhodesiense*, 8 to 10% of individuals of *G. morsitans* examined being infected with it. [The possibility of confusion with *T. brucei* must be borne in mind.—Ed.]

From the writings of German medical officers it would appear that the known infected areas in ex-German East Africa are the southern border of Lake Victoria Nyanza, the vicinity of Lake Tanganyika and the neighbourhood of the Rovuma River from Sassawara to Liwale. In Portuguese East Africa no infected areas were recorded before the War, but during military operations in that region the first case of

trypanosomiasis among the troops occurred, and of the few cases subsequently recorded, four at least must have become infected between the coast and Ankwabe, a distance of some 45 miles. The flies on this route have been investigated; *G. morsitans* and *G. pallidipes* were found, but never *G. palpalis*. *G. pallidipes* was by far the commonest species, but the number of flies varied greatly from day to day. Wild animals are extremely scarce on this road and there are no native dwelling-places; game is however said to be found in numbers about two miles from the road and this is doubtless the source of infection. Flies are also known to occur beyond Ankwabe, but no work on their distribution has been done.

Between Nampula and Lake Nyasa there are extensive fly-belts and much trypanosomiasis occurs in horses and cattle. The flies found include *G. morsitans*, *G. pallidipes*, and *G. fusca* [identification dubious—Ed.]. From Lindi, on the coast, inland to Ngomano and Tunduru, the same species occur and also *G. brevipalpis*. *G. morsitans* is by far the most common species, except in the Lindi area, where *G. pallidipes* is the more abundant. No very sharply defined fly-belts occur on this line, but the abundance of flies varies considerably at different points. The exact spots at which flies are particularly numerous, and those that appear to be free are enumerated. The percentage of *Glossina* infected with trypanosomes is about 11%. Although there seems to be a general belief in this region that human trypanosomiasis occurs, no case of it could be traced.

Investigations indicate that the incubation period is somewhere between 5 to 14 days. Direct inoculation from man to rats produced the disease in about 6 days, death supervening in about 12 days. The fact that *G. palpalis* does not occur in the areas where the disease was contracted confirm the hypothesis that the trypanosome is *T. rhodesiense* rather than *T. gambiense*.

An account is given of the eighteen cases that occurred among the troops, five of these being Europeans and the remainder natives. As soon as the first case was discovered measures were taken to protect the men. Clearing the bush on both sides of the road was quite impracticable. Veils were served out to protect the head and neck of those using the infested roads, the use of shorts was forbidden and Bamber oil [see this *Review* Ser. B. v, p. 181] was issued for the frequent anointing of the hands and bare parts of the arms.

Ferris (G. F.). **Anoplura of the Canadian Arctic Expedition, 1913–1918.**—*Rept. Canad. Arctic Exped. 1913–1918, Ottawa*, 12th September 1919, iii, Insects: Part D, Mallophaga & Anoplura, pp. 11–12 D. [Received 28th October 1919.]

The species dealt with are *Linognathus setosus*, Olfers (frequently recorded as *L. piliferus*, Burm.), great numbers of which were taken from a white fox, on the north coast of Alaska in January, and are identical with individuals previously recorded from the domestic dog; and *Echinophthirius horridus*, Olfers (previously recorded as *E. phocae*, Lucas) taken from a seal, *Phoca hispida*, and inseparable from specimens taken from other seals in the Shetland Islands and on the coast of California.

Lice taken from the heads of Eskimos in the Coronation Gulf region were reported by Prof. G. H. F. Nuttall to be typical specimens of *Pediculus capitis*. No difference can be detected between these and other head lice from different parts of the world. Fleas were collected from the continental arctic fox, *Alopex lagopus innuitus*, from Parry's ground squirrel, *Citellus parryii*, and the Keewatin arctic hare, *Lepus arcticus canus*; these were unfortunately lost before identifications could be made.

Dyar (H. G.). **Mosquitos collected by the Canadian Arctic Expedition, 1913–18 (Diptera, Culicidae).**—*Rept. Canad. Arctic Exped. 1913–1918, Ottawa*, 14th July 1919, iii, Insects: Part C, Diptera, pp. 31–33 C, 2 figs. [Received 28th October 1919].

Collections of mosquitos made during 1913–1916 include 134 individuals from the Arctic coast of Alaska and the Canadian North-west Territories. While mosquitos are present in great numbers, they comprise but few species; those taken include *Aëdes* (*Ochlerotatus*) *nearcticus*, sp. n., both sexes of which are described, some larvae collected with the above that are apparently an undescribed form of *Aëdes*, and a dozen females of an unknown species of *Aëdes*, which await the capture of males or of more perfect specimens before they are named.

Malloch (J. R.). **The Diptera collected by the Canadian Arctic Expedition, 1913–1918 (excluding the Tipulidae and Culicidae).**—*Rept. Canad. Arctic Exped. 1913–1918, Ottawa*, 14th July 1919, iii, Insects: Part C, Diptera, pp. 34–90 C, 38 figs. [Received 28th October 1919.]

In this collection of Diptera are a number of Simuliids, the larvae of which are found only in running water, sometimes in swift streams with rocky beds and sometimes in streams with a moderate current with the bed covered with grass or weeds, to which larvae and pupae are frequently attached. The adults feed generally upon the blood of mammals, but do not often bite man. New species described are *Prosimulium borealis*, from Victoria Island, and *Simulium similis*, from Hood River, North-west Territories.

Only three adult Oestrids occur in the collection, these being females of *Oedemagena tarandi*, L. Larvae of this species were taken from under the skin of caribou in the Barren Grounds. The other recorded host is the reindeer in northern Europe and Alaska. Larvae of *Cephenomyia* sp. are also described from the North-west Territories.

Calliphorid flies include *Cynomyia cadaverina*, R.-D., of which 24 individuals were taken from various regions in the North-west Territories and Alaska; *Calliphora viridescens*, R.-D., which occurs in Europe, is distributed generally throughout North America and has been previously recorded from Alaska; *Phormia terrae-novae*, R.-D., of which 38 individuals were taken from different localities in the North-west Territories and Alaska; and *P. caerulea*, sp. n., of which both sexes are described from the North-west Territories. A key is given to the species of this genus.

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